SEARCH REQUEST FORM

Requestor's Name:		Serial Number:	
Date:	Phone:		Art Unit:
Search Topic: Please write a detailed statement of terms that may have a special mean please attach a copy of the sequent	ming. Give example:	s or relevent citations, authors, k	subject matter to be searched. Define any seywords, etc., if known. For sequences, lost relevent claim(s).
•			
	·		
•			
		·	
	STA	AFF USE ONLY	
Date completed: 0.7-15- Searcher: CeJ Cv/1 Terminal time: 2.0 Elapsed time: CPU time: Total time: 2-5 Number of Searches:	<u>, e 4</u> 951	Search Site STIC CM-1 Pre-S Type of Search N.A. Sequence A.A. Sequence	Vendors IG STN Dialog APS Geninfo SDC
Number of Databases:		Structure	DARC/Questel

PTO-1590 (9-90)

•		ang Providence Space 機関語 parado et Tro で ang Providence Space	· · · · · · · · · · · · · · · · · · ·		To the Time	To the second second
		ega er				, stw
X Vint			*	į.	**	
4						
\$						
F						
is a super	in the supplier of the supplier of	· Paragram				
	A TO COMPANY OF THE PROPERTY OF			Reference of the second	(8- Mari terroration)	e will the comment
r" ₹						
•						**************************************
		*.				
						i,
- }						
		1 - Same of the same of			· X.	**
₽		· ·		÷		**************************************
н.	•	•				
			·			
i de		No.				
		,				
		,				
						•

/

OM protein

Run on:

Sequence:

```
AAR23787
AAY34991
AAY00869
AAG91100
AAB79423
AAY50819
                                                                                                        AAW73553
AAX17523
AAW09257
                                                                                                                            AAB19285
AAW34567
                                      AAR96109
AAP94635
                                                                                                                                        AAE05691
AAY78513
                                  AAR80037
                                             AAR1127
                                                  AAU60903
                                                      AAB69074
                                                          AAU60913
                                                              AAY0087C
                                                                                                     AAW73552
                                                                                                                    AAW0925
                                                                                                                                    AAY35095
                                                                                                                                                AAY27357
                                                                                                                       AAW4987
                                                                                                 AAY37
                                                                                             AAY91
us-09-298-924-6.rag / prophytic 6/14/95
                                   399
399
374.5
371.5
371.5
348
348
346.5
342.5
                                                                                 alignments)
Million cell updates/sec
                                                                                    ........PQHIEEGKYEFDKGFALYKL 559
                                                            July 15, 2002, 12:16:23 ; Search time 58.93 Seconds
                                                                                                                747574
                                      4.5
Compugen Ltd.
                                                                 (without a 1053.627 p
                                                                                                               Total number of hits satisfying chosen parameters:
                                                                                                       747574 seqs, 111073796 residues
                                      version
- 2000
                                                                                                                                   Post-processing: Minimum Match 0%
Maximum Match 100%
Listing first 45 summaries
                                                     protein search, using sw model
                                                                                            BLOSUM62
Gapop 10.0 , Gapext 0.5
                                                                                    1 MTFAYKIDGNEVIFTLWAPY
                                      GenCore
Copyright (c) 1993
                                                                                                                       seq length: 0 seq length: 2000000000
                                                                           US-09-298-924-6
2978
                                                                            Title:
Perfect score:
                                                                                            Scoring table:
```

S. tuberosum isoam
Heat-resistant pul
C. pneumoniae prot
S. tuberosum isoam
C glutamicum prote
Corynebacterium gl
Wheat isoamylase p
S. tuberosum debra
Group B Streptococ
Protein involved i
Pullulanase protei
Full length Pullul
Zea mays SUI starc
Bacillus alkaline

B. thuringlensis a B.stearothermophil Propionibacterium Aquifex aeolicus V Propionibacterium S. tuberosum isoam

Bacillus stearothe Starch-branching-e

ALIGNMENTS

1: /SIDSI/gcgdata/hold-geneseq/geneseqp-embl/AA1980.DAT:*
2: /SIDSI/gcgdata/hold-geneseq/geneseqp-embl/AA1981.DAT:*
3: /SIDSI/gcgdata/hold-geneseq/geneseqp-embl/AA1981.DAT:*
4: /SIDSI/gcgdata/hold-geneseq/geneseqp-embl/AA1981.DAT:*
5: /SIDSI/gcgdata/hold-geneseq/geneseqp-embl/AA1981.DAT:*
6: /SIDSI/gcgdata/hold-geneseq/geneseqp-embl/AA1981.DAT:*
7: /SIDSI/gcgdata/hold-geneseqy-embl/AA1981.DAT:*
8: /SIDSI/gcgdata/hold-geneseqy-embl/AA1981.DAT:*
9: /SIDSI/gcgdata/hold-geneseqy-embl/AA1980.DAT:*
110: /SIDSI/gcgdata/hold-geneseqy-embl/AA1980.DAT:*
121: /SIDSI/gcgdata/hold-geneseqy-embl/AA1980.DAT:*
122: /SIDSI/gcgdata/hold-geneseqy-embl/AA1980.DAT:*
123: /SIDSI/gcgdata/hold-geneseqy-embl/AA1980.DAT:*
143: /SIDSI/gcgdata/hold-geneseqy-embl/AA1990.DAT:*
144: /SIDSI/gcgdata/hold-geneseqy-embl/AA1991.DAT:*
145: /SIDSI/gcgdata/hold-geneseqy-embl/AA1991.DAT:*
146: /SIDSI/gcgdata/hold-geneseqy-embl/AA1991.DAT:*
147: /SIDSI/gcgdata/hold-geneseqy-embl/AA1990.DAT:*
148: /SIDSI/gcgdata/hold-geneseqy-embl/AA1990.DAT:*
149: /SIDSI/gcgdata/hold-geneseqy-embl/AA1999.DAT:*
151: /SIDSI/gcgdata/hold-geneseqy/geneseqp-embl/AA1999.DAT:*
152: /SIDSI/gcgdata/hold-geneseqy/geneseqp-embl/AA1999.DAT:*
153: /SIDSI/gcgdata/hold-geneseqy/geneseqp-embl/AA1999.DAT:*
154: /SIDSI/gcgdata/hold-geneseqy/geneseqp-embl/AA1999.DAT:*
155: /SIDSI/gcgdata/hold-geneseqy/geneseqp-embl/AA1999.DAT:*
156: /SIDSI/gcgdata/hold-geneseqy/geneseqp-embl/AA1999.DAT:*
157: /SIDSI/gcgdata/hold-geneseqy/geneseqp-embl/AA1999.DAT:*
158: /SIDSI/gcgdata/hold-geneseqy/geneseqp-embl/AA1999.DAT:*
158: /SIDSI/gcgdata/hold-geneseqy/geneseqp-embl/AA1999.DAT:*
158: /SIDSI/gcgdata/hold-geneseqy/geneseqp-embl/AA1999.DAT:*
158: /SIDSI/gcgdata/hold-geneseqy/geneseqp-embl/AA1997.DAT:*

A_Geneseq_032802:*

Database

Minimum DB Maximum DB

Searched:

Sequence of amy C Bacillus deramific N. denitrificans a Alpha-glucosidase Protein encoded by

AAE05719 AAW90977 AAR43340 AAW70886

A polypeptide with Thermotoga maritim C. pneumoniae prot Bacillus acidopull Pullulanase (pulB) Group B Streptococ

Thermotoga maritim

Bacillus alkaline

```
transferase; amylase; Sulfolobus; production; alpha, alpha-trehalose; malto-oligosaccharide; hydrolysis.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Sulfolobus spp. derived transferase and amylase - for production of
                                                                                                                                                                                                                                                                                                                                    Sulfolobus solfataricus amylase for alpha, alpha-trehalose prodn
                                                                             AAR90619 standard; Protein; 559 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        95JP-0120673.
94JP-0133354.
94JP-0194223.
94JP-0290394.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              95WO-JP01189.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            94JP-0311185
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Sulfolobus solfataricus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              BEER KK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            WPI; 1996-049671/05.
N-PSDB; AAT12325.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              (KIRI ) KIRIN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       15-JUN-1994;
18-AUG-1994;
31-OCT-1994;
21-NOV-1994;
21-NOV-1994;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              14-JUN-1995;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          W09534642-A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     21-APR-1995;
                                                                                                                                                                                                                                                  29-JUN-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            21-DEC-1995
                                                                                                                                                                AAR90619;
RESULT
AAR90619
                                                                                      THE STATE OF THE S
```

Pred. No. is the number of results predicted by chance to have a score greater than or equal to the score of the result being printed and is derived by analysis of the total score distribution.

C glutamicum prote Corynebacterium gl Trehalose releasin Trehalose releasin

Trehalose-releasin Sulfolobus acidoca Sulfolobus solfata

AAR92755 AAR90620 AAG92072 AAB80206 AAR90619

117 117 116 116 116 21 21

556 556 556 610 598 597 598 575

36.6 35.6 35.5

2978 1748.5 1748.5 1089.5 1069.5 1060.5 1058 1025 1025 1025 1025

110 10 10 10 10

Description

BB

Length

Query Match

Score

Result No.

100.0

Trebalose releasin Trebalose releasin Trebalose-releasin Trebalose-releasin

AAR80290 AAR80289 AAR77470 AAX85157 AAX85165

N

```
a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                               on a saccharide having at least three sugar units, which are pref.

glucose units at the reducing end (the linkage between the first and
second glucose units is alpha-1, while the linkage between the
second and third glucose units is alpha-1,4), to hydrolyse alpha-1,4
linkages within the sugar chain, yielding alpha, alpha-trehalose and also
mono- and disaccharide hydrolysis products. The amplase has a mal. wt. of
61 to 64 kba. It is characterised by working at pH 4.5-5.5 and at 60-85
deg.C. It has an isoelectric point of 4.3-5.4 and retains at least
100 percent activity after 6 hrs at 80 deg.C. It is completely inhibited
by 5 mm copper sulphate. Use of a transferase and the amylase in
succession on suitable substrates such a malto-oligosaccharides, is
                                                                                                                                                                                                                                          ;
0
                                          The amylase acts
                                                                                                                                                                                                                                                                                                                                                                                      240
                                                                                                                                                                                                                                                                                                                                                                                                          240
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   420
                                                                                                                                                                                                                                                                                                               300
                                                                                                                                                                                                                                                                                                                                                                                                                                         PVGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEY 420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        GEENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFYKI 480
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            480
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                540
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     540
                                                                                                                                                                                                                                                                                                     LDDASEIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDLIIYEIHVGTFTPEGTFE 120
                                                                                                                                                                                                                                                                                                                                              GVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHK 180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       YNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGE 360
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Gaps
                                                                                                                                                                                                                                                             1 MTFAYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYV 60
                                                                                                                                                                                                                                                                        WIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEKCG
                                                                                                                                                                                                                                                                                                                                                                                      KGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ö
                                                                                                                                                                                                                    100.0%; Score 2978; DB 17; Length 559; 100.0%; Pred. No. 3.6e-236; Ive 0; Mismatches 0; Indels 0;
 alpha, alpha-trehalose from malto-oligosaccharide(s)
                                        The amylase is derived from Sulfolobus solfataricus.
                                                                                                                                                                   the production of alpha, alpha-trehalose.
                   Claim 108; Page 235-240; 357pp; Japanese.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 556
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   QHIEEGKYEFDKGFALYKL 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             AAR92755 standard; Protein;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        (first entry)
                                                                                                                                                                                                                                          Conservative
                                                                                                                                                                                                                              Local Similarity
nes 559; Conserv
                                                                                                                                                                                      559 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       03-AUG-1996
                                                                                                                                                                                        Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  AAR92755;
                                                                                                                                                                                                                      Query Match
                                                                                                                                                                                                                                Best Loca
Matches
                                                                                                                                                                                                                                                                                                                                                                 121
                                                                                                                                                                                                                                                                                                                                                                                                          181
                                                                                                                                                                                                                                                                                                                                                                                                                             241
                                                                                                                                                                                                                                                                                                                                                                                     181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              361
                                                                                                                                                                                                                                                                                                     61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  361
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     AAR92755
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            RESULT
g
                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                        ద
                                                                                                                                                                                                                                                                                                                                                               q
                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ΩI
                                                                                                                                                                                                                                                                                                                                              ó
                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        XXXX
```

```
DDASEIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDLIIYEIHVGTFTPEGTFEG 121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 242 IKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEKCGY 301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         362 VGELDGCNEVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPY1PMIFMGEEYG 421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              A thermostable enzyme (AAR92755) of Sulfolobus acidocaldarius AFCC 33909 releases trehalose from non-reducing saccharides having a trehalose structure as an end unit and a degree of polymerisation of at least 3. It has a mol.wt. of 54.64 kDa (SDS-PAGE), a pl of 5.6-6.6 and is substantially not inactivated when incubated in aq. solution (PH 7.0) at 85 deg for 60 min. Recombinant enzyme is obtd. by expression of an isolated DNA fragment (AAT16899) in host cells, pref. Escherichia coli, using e.g. vector pBluescript
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Sulfolobus acidocaldarius, -
saccharide at temps. exceeding
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         2 TFAYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      VIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               GLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYW
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   pref. Escherichia coli, using e.g. vector pBluescript
The trehelose is useful as a sweetener.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    302 NIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRTHGEP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Length 556;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DB 17;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               4.1e-135;
hes 136;
                                                                                        Sulfolobus acidocaldarius strain ATCC 33909
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ; Score 1748.5;
; Pred. No. 4.1e
87; Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Recombinant thermostable enzyme from releases trehalose from non-reducing
                                                                                                                                                                                                                                                                                                                                                                                                                   Sugimoto T;
                                                                                                                                                                                                                                                                                                                                                                     (HAYB ) HAYASHIBARA SEIBUTSU KAGAKU
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Claim 2; Page 53-54; 74pp; English
Trehalose-releasing thermostable
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     58.7%;
58.9%;
                                                                                                                                                                                                                                                                            95JP-0189760
                                                                                                                                                                                                                                                                                               94JP-0190180.
                                                                                                                                                                                                                                 95AU-0027131
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                   Kubota M, Mitsuzumi H,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 55 degrees Centigrade
                                                                                                                                                                                                                                                                                                                                                                                                                                                                WPI; 1996-106284/12.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         556 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        N-PSDB; AAT16899
                                             Thermostable
                                                                                                                                                                                                                                 21-JUL-1995;
                                                                                                                                                                                                                                                                                                  21-JUL-1994;
11-APR-1995;
                                                                                                                                   AU9527131-A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Query Match
Best Local Simi
Matches 329;
                                                                                                                                                                                 01-FEB-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           SK(+).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             62
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               182
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            182
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              300
```

ŝ

61

241 241

1/

482

ò g οy g

a ò

g

```
242 IKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEKCGY 301
                                                                                                                                                                                                                                                                                                                                                                                                 302 NIDAQWYDDFHHSIHAYLIGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGEP 361
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         362 VGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYG 421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            482 IKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFPQ 541
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             480 inirkryn-nckrvkevrregncitlimekigiiasfddivinskitgnlligi--gfpk 536
                                                                                                                                                                    122 VIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKK 181
                                                                                                                                                                                                                                              GLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYW 241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   EENPFYFFSDFSDSKLIQGVREGRKKENGODTDPQDESTFNASKLSWKIDEEIFSFYKIL 481
                                       TFAYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVL
                                                                                           DDASEIPDPASRYQPECVHGPSQIIQESKEFNNETFLKKEDLIIYEIHVGTFTPEGTFEG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        amino acid synthesis; vitamin; saccharide;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ×
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Ochiai
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Hayashi M,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  C glutamicum protein fragment SEQ ID NO: 5826
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              H, Ando S, Hayasl
Ikeda M, Ozaki A;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     AAG92072 standard; Protein; 595 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         (KYOW ) KYOWA HAKKO KOGYO KK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            18-DEC-2000; 2000EP-0127688
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 2000JP-0159162
2000JP-0280988
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 99JP-0377484
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Corynebacterium glutamicum.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         537 klkkdelikvnrgvgvyql
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    HIEEGK-YEFDKGFALYKL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Mizoguchi I
Senoh A,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           organic acid synthesis.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        bacterium;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     WPI; 2001-376931/40
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   07-APR-2000;
03-AUG-2000;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 16-DEC-1999;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 EP1108790-A2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             26-SEP-2001
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                άχ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Coryneform
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Nakagawa
Tateishi
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          AAG92072;
                                                                                                                                                                                                                                                                                   182
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   422
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 AAG92072
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                RESULT
                                                                                                                         pp
                                                                                                                                                                  Ω
                                                                                                                                                                                                       g
                                                                                                                                                                                                                                            Qγ
                                                                                                                                                                                                                                                                             ΩD
                                                                                                                                                                                                                                                                                                                      Ω
                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                           ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   The amylase is derived from Sulfolobus acidocaldarius. The amylase acts on a saccharide having at least three sugar units, which are pref. glucose units at the reducing end (the linkage between the first and second glucose units is alpha-1, alpha-1, while the linkage between the second and third glucose units is alpha-1, while the linkage between the second and third glucose units is alpha-1, while the linkage alpha-1, linkages within the sugar chain, yielding alpha, alpha-trehalose and also mono- and disaccharide hydrolysis products. The amylase has a mol. wt. of 61 to 64 kDa. It is characterised by working at pH 4.5-5.5 and at 60-85 deg.C. It has an isoelectric point of 4.3-5.4 and retains at least 100 percent activity after 6 hrs. at 80 deg.C. It is completely inhibited by 5 mw copper sulphate. Use of a transferase and the amylase in succession on sultable substrates such a malto-oligosaccharides, is useful for the production of alpha, alpha-trehalose.
                                                      360 vgdlpprkfvvfiqnhdqvgnrgngerlsiltdkttylmaatlyilspyiplifmgeeyy 419
                                                                                                           IKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFPQ 541
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         transferase; amylase; Sulfolobus; production; alpha, alpha-trehalose; malto-oligosaccharide; hydrolysis.
                                     EENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFYKIL 481
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               oŧ
                                                                                                                                                                                                                                                                                                                                                                                                                                    Sulfolobus acidocaldarius amylase for alpha, alpha-trehalose prodn.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             - for production
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     7;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Length 556;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            58.7%; Score 1748.5; DB 17; Lengt
58.9%; Pred. No. 4.1e-135;
.ive 87; Mismatches 136; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Sulfolobus spp. derived transferase and amylase - fo. alpha, alpha-trehalose from malto-oligosaccharide(s)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Claim 112; Page 244-250; 357pp; Japanese
                                                                                                                                                                                                                                                                                                                        A
                                                                                                                                                                                                                                                                                                                      AAR90620 standard; Protein; 556
                                                                                                                                                                                                         537 klkkdelikvnrgvgvyql 555
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            95JP-0120673.
94JP-0133354.
94JP-0194223.
94JP-0290394.
                                                                                                                                                                                     542 HIEEGK-YEFDKGFALYKL 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           95WO-JP01189
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       94JP-0286917
94JP-0311185
                                                                                                                                                                                                                                                                                                                                                                                                 (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Sulfolobus acidocaldarius
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Best Local Similarity 58.9
Matches 329; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 (KIRI ) KIRIN BEER KK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     WPI; 1996-049671/05.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ¥,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          N-PSDB; AAT12326
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       556
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  18-AUG-1994;
31-OCT-1994;
21-NOV-1994;
21-NOV-1994;
```

14-JUN-1995;

21-DEC-1995

21-APR-1995

15-JUN-1994

Sulfolobus

Sequence

Query Match

29-JUN-1996

AAR90620;

Ĥ

Yokoi

AAB80206 standard; Protein; 610 AA.

```
. 11;
                                                                                                                                                                                                                                                                  The present invention provides a number of nucleotide and protein sequences from the Coryneform bacterium Corynebacterium glutamicum. These are useful for identifying the mutation point of a gene derived from a mutant of coryneform bacterium, measuring expression amount and analysing the expression profile or expression pattern of a gene derived from coryneform bacterium, and identifying a homologue of a gene derived from coryneform bacterium. Coryneform bacteria are useful for producing amino acids, nucleic acids, vitamins, saccharides and organic acids, particularly L-lysine. The present sequence is a protein described in the exemplification of the invention.

Note: The sequence data for this patent did not form part of the printed specification, but was obtained in electronic format directly from the European Patent Office.
                                                        Novel polynucleotides derived from Coryneform bacteria, for identifying mutation point of a gene, measuring expression of a gene, analysing expression profile or pattern of a gene and identifying homologous gene
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         36.6%; Score 1089.5; DB 22; Length 595;
41.5%; Pred. No. 6.5e-81;
ive 93; Mismatches 198; Indels 29; Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | | ||:||||| |:: :| : :: ||:||||||: || prstsqpdgvhglsevsddsylwgdqqwtgrilpgsvlyelhvgtfsedgtfegvvdklp 145
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      DGFRLDAVHAIIDTSPKHILEEIADVVHKYN-----RIVIAESDLNDPRVVNPKEKCGY 301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   YLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVIL 187
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 DVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWIKEYNV 247
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        YGEENPFYFFSDFSDSKLIQGVREGRKKE-----NGQD-TDPQDESTFNASKLSWKIDE 472
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            PASRYQPEGVHGPSQIIQESKEFNNETFLKK -- EDLIIYEIHVGTFTPEGTFEGVIRKLD 127
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  362 VGE--LDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEE 419
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          385 vhpditpasrfvtyttthdqtgnraigdrpsttltpeqqvlkaaiiysspytpmlfmgee 444
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         E---IFSFYKILIKMRKELSIACDR--RVNVNGENWLIIKGREYFSLYVFSKSSIEVKY 527
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                fsvwaplphdvhl-ilngetlpmhktegswwraei-apkagdrygfslfdgsswsktlpd 85
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    FTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVLDDASE----IPD 69
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Claim 17; SEQ ID NO: 5826; 246pp + Sequence Listing; English.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Query Match
Best Local Similarity 41.5%
Matches 227; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       595 AA;
N-PSDB; AAH67291
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  528 SGTLLLS 534
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ggeliys 571
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        473
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         146
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 188
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             206
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             28
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        70
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    86
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                128
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      248
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              565
```

g ò a ö g δ g ð g δ 셤 ò g ò g

ò

RESULT AAB80206

g

ö g

ò

```
fine chemical production; microorganism; organic acid; nucleoside; nonproteinogenic amino acid; purine base; pyrimidine base; nucleotide; lipid; saturated fatty acid; upsaturated fatty acid; diol; vitamin; carbohydrate; aromatic compound; cofactor; polyketide; enzyme.
                                                                       Corynebacterium glutamicum; metabolic pathway protein; MP protein;
                                                     Corynebacterium glutamicum MP protein sequence SEQ ID NO:1146
                                                                                                                                                                                                                                                                                                                                                                                                 99DE-1031636.
99DE-1032125.
99DE-1032136.
99DE-1032136.
99DE-1032186.
99DE-1032206.
99DE-1032227.
                                                                                                                                                                                                                           99DE-1031415.
99DE-1031418.
99DE-1031419.
99DE-1031420.
                                                                                                                                                                                                                                                              99DE-1031424.
99DE-1031428.
99DE-1031434.
                                                                                                                                                                                                                                                                                                   99DE-1031443.
99DE-1031453.
99DE-1031457.
                                                                                                                                                                                                                                                                                                                                                      99DE-1031541.
99DE-1031573.
99DE-1031592.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          99DE-1032928.
99DE-1033004.
99DE-1033005.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             99US-0148613.
99DE-1040764.
99DE-1040765.
                                                                                                                                                                                                                                                                                                                             99DE-1031465.
99DE-1031478.
                                                                                                                                                                                                                                                                                                                                               99DE-1031510.
                                                                                                                                                                                                                                                                                         99DE-1031435
                                                                                                                                                                                                                                                                                                                                                                                99DE-1031632
99DE-1031634
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  99DE-1032230.
                                                                                                                                                                                23-JUN-2000; 2000WO-IB00923
                                                                                                                                                                                                                  99US-0142101
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          99DE-1032922
99DE-1032926
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      99DE-1033006
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          39DE-1040766
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 99DE-1040832
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            99DE-1041378
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               99DE-1042077
99DE-1042079
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    99DE-1041379
                                                                                                                           Corynebacterium glutamicum
                                  30-APR-2001 (first entry)
                                                                                                                                             WO200100843-A2
                                                                                                                                                                                                                                                                                       08-JUL-1999;
08-JUL-1999;
08-JUL-1999;
08-JUL-1999;
08-JUL-1999;
                                                                                                                                                                                                                                                     08-JUL-1999;
08-JUL-1999;
08-JUL-1999;
08-JUL-1999;
                                                                                                                                                                                                                                                                                                                                                                                08-JUL-1999;
08-JUL-1999;
                                                                                                                                                                                                                                                                                                                                                                                                                                              09-JUL-1999;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              03-SEP-1999;
03-SEP-1999;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          27-AUG-1999;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  27-AUG-1999;
                                                                                                                                                               04-JAN-2001
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      14-JUL-1999
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               .2-AUG-1999
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               27-AUG-1999
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            31-AUG-1999
                 AAB80206;
```

```
161 VQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTF 220
 534
 SGILLLS
                          580 ggeliys
                                                                                                                                                                                                                                                                                                                                                                                         J7-MAR-1995;
                                                                                                                                                                                                                                                                                                                                                                                                                      J7-MAR-1994;
                                                                                                                                                                                                                                                                                                                                                                                                                                     07-MAR-1994;
                                                                                                                                                          25-JAN-1996
                                                                                                                                                                                                                                                                                                                                  EP671470-A2
                                                                                                                                                                                                                                                                                                                                                              13-SEP-1995
                                                                                                                             AAR77471;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 end unit
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Query Match
                                                                       9
528
                          셤
                                                                                                                            qq
ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    음
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            QΥ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          11;
                                                                                                                                                                                                                                                                                                             AAF71753 to AAF72330 encode the Corynebacterium glutamicum metabolic pathway (MP) proteins given in AAB79634 to AAB80211. The C. glutamicum MP nucleic acids are useful for the production of fine chemicals in microorganisms, including organic acids, nonproteinogenic amino acids, purine and pyrimidine bases, nucleosides, nucleotides, lipids, saturated and unsaturated fatty acids, diols, carbohydrates, aromatic compounds, vitamins, cofactors, polyketides and enzymes.
                                                                                                                                                                                                                                               acids,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | | ||:|||| ||: :| : : : :||:|||||: || prstsqpdgyhglsevsddsylwgdqqwtgrilpgsvlyelhvgtfsedgtfegvvdklp 160
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      fsvwaplphdvhl-ilngetlpmhktegswwraei-apkagdrygfslfdgsswsktlpd 100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   YGEENPFYFFSDFSDSKLIQGVREGRKKE-----NGQD-TDPQDESTFNASKLSWKIDE 472
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              PASRYQPEGVHGPSQIIQESKEFNNETFLKK--EDLIIYEIHVGTFTPEGTFEGVIRKLD 127
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    YLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVIL 187
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    DGFRLDAVHAIIDTSPKHILEEIADVVHKYN-----RIVIAESDLNDPRVVNPKEKCGY 301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        29; Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     FTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVLDDASE----IPD 69
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            302 NIDAQWVDDFHHSIHAYLTGEROGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRKTHGEP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             DVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWIKEYNV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        dvvynhfgpdgnyngqfgpytsgg-stgwgdvvninghdsdevrnyildaarqwfedfhv
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   VGE--LDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             E---IFSFYKILIKMRKELSIACDR--RVNVVNGENWLIIKGREYFSLYVFSKSSIEVKY
                                                                                                                                                                                                          Nucleic acids from Corynebacterium glutamicum encoding metabolic pathway proteins, useful for producing fine chemicals in microorganisms, including organic acids, nonproteinogenic amino and purine and pyrimidine bases.
                                                                                                                                                                                                                   Corynebacterium glutamicum encoding metabolic
                                                                                                                                           ë
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Length 610;
                                                                                                                                           Haberhauer
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ; Score 1089.5; DB 22;
; Pred. No. 6.7e-81;
93; Mismatches 198; Ii
                                                                                                                                         Zelder O,
                                                                                                                                                                                                                                                                                   Claim 20; Page 1722-1725; 1737pp; English.
                                                                                                                                           Schroeder H,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                            36.6%;
41.5%;
                       99DE-1042088.
99DE-1042095.
99DE-1042124.
99DE-1042129.
2000US-0187970.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Local Similarity 41.5 hes 227; Conservative
                                                                                                                                           В,
                                                                                                                                           Kroeger
                                                                                                                                                                    WPI; 2001-137957/14.
N-PSDB; AAF72325.
                                                                                                                                                                                                                                                                                                                                                                                                                                   610 AA;
                                                                                                                AG.
                                                                                                              (BADI ) BASE
                                                                   03-SEP-1999;
                          03-SEP-1999
                                      03-SEP-1999
                                                       03-SEP-1999
                                                                                                                                         Pompejus M,
                                                                                                                                                                                                                                                                                                                                                                                                                                   Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Ouery Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Matches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 43
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       101
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                161
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           188
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    248
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   362
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                400
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  520
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    128
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        221
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         460
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       473
```

g

ò g ò g ò g ò Q à g ò g à

ð g ò

```
16;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 This enzyme can be used for the preparation of trehalose with high yields and efficiency from non-reducing saccharides such as alpha-glucosyltrehalose, alpha-maltotsyltrehalose and alpha-maltottriosyltrehalose. The trehalose can be used as a sweetener, taste-improving agent, quality-improving agent, stabiliser, filler, excipient or adjuvant in food products cosmetics and pharmaceuticals.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       --TLNNVKVRDRYKYVLD-DASEIPDPASRYQPEGVHGPSQIIQESK-EFNNETFLKKE- 101
                                                                                                                                                                                                                                                                                                                                                                              Enzyme; trehalose; alpha-glucosyltrehalose; alpha-maltosyltrehalose; alpha-maltotriosyltrehalose; alpha-maltoterrasyltrehalose; maltopentaosyltrehalose; sweetener; taste-improving agent; stabiliser; filler; excipient; adjuvant; foodstuffs; cosmetics;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     MTFAYKIDGNEVI-----FTLWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTI--
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             mthtypreaakpvlgparydvwapnaesvtl--laggeryamgrraetgpedagwwtaag
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           -DLIIYEIHVGTFTPEGTFEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVXLYA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  qgaviyelhlgtftpegtleaaagkldylaglgvdfiellpvnafngthnwgydgvqwfa
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            63;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          DNA encoding a trehalose releasing enzyme - which releases treh
from a non-reducing saccharide having a trehalose structure as
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  DB 16; Length 598;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Pred. No. 1.6e-78;
2; Mismatches 197; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          K;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Tsusaki
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               35.6%; Score 1060.5; 39.7%; Pred. No. 1.6e
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      (HAYB ) HAYASHIBARA SEIBUTSU KAGAKU
                                                                                                                                                  AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Sugimoto T,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Claim 6; Page 27-29; 45pp; English
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         92;
                                                                                                                                         AAR77471 standard; Protein;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 94JP-0059840
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       95EP-0301474
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            94JP-0059834
                                                                                                                                                                                                                                                                                                                          Trehalose releasing enzyme
                                                                                                                                                                                                                                                                (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Hattori K, Kubota M,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            036.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       WPI; 1995-312772/41.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Best_Local Similarity
Matches 232; Conser
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            598 AA;
586
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Arthrobacter sp.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        pharmaceuticals.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         N-PSDB; AAQ98672
```

ø

```
NFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRI 280
                                                           281 V-----IAESDLNDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLD 334
                                                                                                                   335 DIVKSYKDVFVYDGKYSNFRKTHGEPVGELDGCNF-----VVYIQNHDQVGNRGKG 386
                                                                                                                                                                                                                     ERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRK 446
                                                                                                                                                                                                                                                drlsqtlpygslalaavltltgpftpmllmgeeygastpwqfftshpepelgkataegri 468
                                                                                                                                                                                                                                                                             447 KE---NGQD----TDPQDESTFNASKLSWKIDEE----IFSFYKILIKMRKELSIAC-- 492
                                                                                                                                                                                                                                                                                                          469 kefermgwdpavvpdpgdpetfrrskldwaeaaegdharllelyrsltalrrstpdltkl 528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  releases trehalose
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Enzyme; trehalose; alpha-glucosyltrehalose; alpha-maltosyltrehalose; alpha-maltotriosyltrehalose; alpha-maltotriosyltrehalose; maltopentrasyltrehalose; sweetener; taste-improving agent; stabiliser; filler; excipient; adjuvant; foodstuffs; cosmetics;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  This enzyme can be used for the preparation of trehalose with high yields and efficiency from non-reducing saccharides such as alpha-glucosyltrehalose, alpha-maltosyltrehalose, alpha-maltotriosyltrehalose, and maltopentaosyltrehalose. The trehalose can be used as a sweetener,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               DNA encoding a trehalose releasing enzyme – which releases trehald from a non-reducing saccharide having a trehalose structure as an
                                                                                                                                                                                                                                                                                                                                                           | :| : :|| || 529 gfedtqvafdedarwlrfrrggvqvllnfseqpvsldgagtall
                                                                                                                                                                                                                                                                                                                                      --- DRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Tsusaki
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             (HAYB ) HAYASHIBARA SEIBUTSU KAGAKU
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Claim 3; Page 24-25; 45pp; English.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Sugimoto T,
                                                                                                                                                                                                                                                                                                                                                                                                                                         AAR80290 standard; Protein;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     95EP-0301474.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  94JP-0059840.
94JP-0059834.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Trehalose releasing enzyme
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Hattori K, Kubota M,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Arthrobacter sp. 036
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       WPI; 1995-312772/41.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     N-PSDB; AAQ98670
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      pharmaceuticals
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     07-MAR-1995;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  07-MAR-1994;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  07-MAR-1994;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  19-JAN-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            EP671470-A2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        13-SEP-1995
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       AAR80290;
                                                                                                                                                                                                                                                409
                                                                    235
                                                                                                                                                                                                                   387
                                                                                                                                                                                                                                                                                                                                                                                                                            AAR80290
                                                                                                                                                                                                                                                                                                                                                                                                               RESULT
                                                                                                                           g
                                                                                                                                                                                  g
                                                                                                                                                                                                                                             a
                                                                                                                                                                                                                                                                                                                                                                                                                                                         a
                                         ö
                                                                    g
                                                                                               à
                                                                                                                                                           õ
                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                                                                 요
```

```
63 -DASEIPDPASRYQPEGVHGPSQIIQESK-EFNNETFLKKE--DLIIYEIHVGTFTPEGT 118
                                                                                                                                                                                                                                               119 FEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEA 178
                                                                                                                                                                                                                                                              HKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENV 238
                                                                                                                                                                                                                                                                                                                                                           EYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIV-----IAESDLNDPRV 292
                                                                                                                                                                                                                                                                                                                                                                             293 VNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSN 352
                                                                                                                                                                                                                                                                                                                                                                                                                          312 lyprdvngyglegqwsddfhhavhvnvtgettgyysdfdslaalakvlrdgffhdgsyss 371
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    petfrrskldwaeaaegdharllelyrsltalrrstpdltklgfedtqvafdedarwlrf 545
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     FRRKTHGEPVGELDGCNF-----VVYIQNHDQVGNRGKGERIIKLVDRESYKIAAAL 404
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          405 YLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQD 457
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ESTFNASKLSWKIDEE----IFSFYKILIKMRKELSIAC-----DRRVNVVNGENWLII 507
taste-improving agent, quality-improving agent, stabiliser, filler, excipient or adjuvant in food products cosmetics and pharmaceuticals.
                                                                                                           Gaps
                                                                                                                                     14 FTLWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTI----TLNNVKVRDRYKYVLD 62
                                                                                                                                                    Enzyme; trehalose; alpha-glucosyltrehalose; alpha-maltosyltrehalose; alpha-maltotrizosyltrehalose; and maltopertrasyltrehalose; maltopentaosyltrehalose; sweetener; taste-improving agent; stabiliser; filler; excipient; adjuvant; foodstuffs; cosmetics;
                                                                                                                                                                                                           Length 597;
                                                                             35.5%; Score 1058; DB 16;
40.5%; Pred. No. 2.5e-78;
ive 88; Mismatches 191;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    508 KGREYFSLYVFSKSSIEVKYSGTLLL 533
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    AAR80289 standard; Protein; 589
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         (first entry)
                                                                                                         Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Trehalose releasing
                                                                                             Similarity
                                        AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Rhizobium sp. M11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    pharmaceuticals.
                                      597
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        19-JAN-1996
                                                                                                         Matches 229;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SP671470-A2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   13-SEP-1995
                                        Sequence
                                                                              Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              AAR80289
                                                                                             Best Local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         œ
                                                                                                                                                                                                                                                                                                     179
                                                                                                                                                                                                                                                                                                                                192
                                                                                                                                                                                                                                                                                                                                                           239
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               372
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     353
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          486
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               546
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    AAR80289
88866
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                q
                                                                                                                                                                                                                                                                                                                               Q
                                                                                                                                                                                                                                                                                                                                                                                  Db
                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        D
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                     ò
                                                                                                                                                                                          ò
                                                                                                                                                                                                                                               δ
                                                                                                                                                                                                                                                                        qq
                                                                                                                                                                                                                                                                                                    δy
                                                                                                                                                                                                                                                                                                                                                          òγ
                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      à
```

```
Query Match
Best Local Si
Matches 2299
                                                      AAR77470;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Sequence
            σ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  17
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        99
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            183
                      AAR77470
              RESULT
                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Db
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                                        16;
                                                                                                                                                                                                       yields and efficiency from non-reducing saccharides such as alpha-glucosyltrehalose, alpha-maltosyltrehalose, alpha-maltottrasyltrehalose and maltotertasyltrehalose. The trehalose can be used as a sweetener, taste improving agent, quality-improving agent, stabiliser, filler, excipient or adjuvant in food products cosmetics and pharmaceuticals.
                                                                                                                                                                                                                                                                                                                                                                                                      EIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDL----IIYEIHVGTFTPEGTFEGV 122
                                                                                                                                                                                                                                                                                                                                                                                                                  :||| :| |||||| |:
plpdprtrrqpegvhalsrtfdpgahrwgdagwggrelqgsviyelhigtftpegtldaa 127
                                                                                                                                                                                                                                                                                                                                                                                                                                                           EKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRK 356
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          : || : || ||||||:| ::|| |||:|| :| :| || :|| ||:|| :| dvngyglagqwsddfhavhvnvsgettgyysdfdslgalakvlrdgffhdgsyssfrgr 367
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       THGEPVGELDGCNF------VVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLS 408
                                                                                                                                 releases trehalose
                                                                                                                                                                                                                                                                                                                                                           FTLWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTITLNNVKVRDRYKYVLD-DAS 65
                                                                                                                                                                                                                                                                                                                                                                        DNA encoding a trehalose releasing enzyme – which releases trehald
from a non-reducing saccharide having a trehalose structure as an
end unit.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      || || chgrpi----nfsavhpaalvvcsqnhdqignratgdrlsqslpygslalaavltltg
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              IRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         LGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    KEYNVDGFRLDAVHAIIDTSPKHILEE---IADVVHKYN---RIVIAESDLNDPRVVNPK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 PYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQDESTF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            NASKLSWK-----IDEEIFSFYKILIKMRK-----ELSIACDRRVNVVNGENWLIIKGR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ||| | : || :| || :|
| trskldwaeasagdhar11elyrs1it1rrstpelar1gfa-dtavefdddarw1----
                                                                                                                                                                                              enzyme can be used for the preparation of trehalose with
                                                                                                                                                                                                                                                                                                                  Length 589;
                                                                                                                                                                                                                                                                                                                                        Indels
                                                                                                                                                                                                                                                                                                                   DB 16;
                                                                                                                                                                                                                                                                                                                            ; Pred. No. 1.3e-75; 80; Mismatches 197;
                                                                           Sugimoto T, Tsusaki K;
                                                                                                                                                                                                                                                                                                                   34.4%; Score 1025; 40.3%; Pred. No. 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      EYFS ---- LYVFSKSSIEVKYSGTLLL 533
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           536 rywrggvqvvlnfadrpisldrpgtall 563
                                                    (HAYB ) HAYASHIBARA SEIBUTSU KAGAKU
                                                                                                                                                                         Claim 3; Page 21-22; 45pp; English.
 95EP-0301474
                      94JP-0059840.
94JP-0059834.
                                                                                                                                                                                                                                                                                                                                      Conservative
                                                                          Kubota M,
                                                                                              WPI; 1995-312772/41.
                                                                                                                                                                                                                                                                                                                            Local Similarity
hes 229; Conserv
                                                                                                                                                                                                                                                                                 589 AA;
                                                                                                        N-PSDB; AAQ98669
07-MAR-1995;
                     07-MAR-1994;
07-MAR-1994;
                                                                          Hattori K,
                                                                                                                                                                                                                                                                                   Sequence
                                                                                                                                                                                                                                                                                                                   Query Match
                                                                                                                                                                                              This
                                                                                                                                                                                                                                                                                                                                     Matches
                                                                                                                                                                                                                                                                                                                                                           14
                                                                                                                                                                                                                                                                                                                                                                                                                          68
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    128
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         183
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             188
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   243
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        248
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              297
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      357
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           368
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            462
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 482
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  308
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 409
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     422
 g
                                                                                                                                                                                                                                                                                                                                                                                                                         셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     qq
                                                                                                                                                                                                                                                                                                                                                           à
                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                              οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
```

```
123 IRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKG 182
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       This enzyme can be used for the preparation of trehalose with high yields and efficiency from non-reducing saccharides such as alpha-glucosyltrehalose, alpha-maltosyltrehalose, alpha-maltotetrasyltrehalose and maltopentacosyltrehalose. The trehalose can be used as a sweetener, taste-improving agent, quality-improving agent, stabiliser, filler, excipient or adjuvant in food products cosmetics and pharmaceuticals.
                                                                                                                                                                                                   Enzyme; trehalose; alpha-glucosyltrehalose; alpha-maltosyltrehalose; alpha-maltotertrasyltrehalose; amaltotertrasyltrehalose; sweetener; taste-improving agent; stabiliser; filler; exciplent; adjuvant; foodstuffs; cosmetics;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         FTLWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTITLNNVKVRDRYKYVLD-DAS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     fdiwapeagtvtl--laggeryemgrrpgngpadegwwtaadaptgadvdygylldgdei
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         EIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDL---IIYEIHVGTFTPEGTFEGV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            LGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        NNA encoding a trehalose releasing enzyme – which releases treh
from a non-reducing saccharide having a trehalose structure as
end unit.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       62;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Length
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Score 1025; DB 16;
Pred. No. 1.3e-75;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          197;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Tsusaki
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 (HAYB ) HAYASHIBARA SEIBUTSU KAGAKU
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Sugimoto T,
     AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Claim 3; Page 27-29; 45pp; English.
  296
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       80;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        34.48;
40.38;
AAR77470 standard; Protein;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      95EP-0301474.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     94JP-0059840.
94JP-0059834.
                                                                                                                                                    Trehalose releasing enzyme.
                                                                                                  (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Hattori K, Kubota M,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 WPI; 1995-312772/41
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Similarity
                                                                                                                                                                                                                                                                                                                                                       Rhizobium sp. M11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               596 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           N-PSDB; AA098671
                                                                                                                                                                                                                                                                                                      pharmaceuticals
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      07-MAR-1995;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        07-MAR-1994;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  07-MAR-1994;
                                                                                                  25-JAN-1996
                                                                                                                                                                                                                                                                                                                                                                                                    EP671470-A2
                                                                                                                                                                                                                                                                                                                                                                                                                                                     13-SEP-1995
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     229;
```

243 KEYNVDGFRLDAVHAIIDTSPKHILEE---IADVVHKYN---RIVIAESDLNDPRVVNPK 296

δλ

```
This sequence represents a trehalose-releasing enzyme amino acid sequence from Arthrobacter sp. S34. This enzyme specifically hydrolyses a non-reducing saccharide having a trehalose structure as an end unit. The invention relates to this enzyme and also to a non-reducing saccharide forming enzyme that forms a non-reducing saccharide having a trehalose structure as an end unit by reducing partial starch hydrolysates. The two enzymes can be used to produce trehalose, a disaccharide consisting of two moles of glucose bound at their reducing residues. The disaccharide is substantially free of reducibility and has moisture retaining abilities. The enzymes are used to produce non-reducing sugars, they are
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       New mesophilic enzyme from Arthrobacter, used to convert starch hydrolysate into non-reducing sugars, particularly trehalose, useful as a sweetener in foods, pharmaceuticals and cosmetics -
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Non-reducing saccharide-forming enzyme; trehalose; disaccharide; food; high yield; trehalose releasing enzyme; moisture retention; cosmetic;
                                                                                                                                                                                                        488
EKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRK 356
                                                                 357 THGEPVGELDGCNF-----VVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLS 408
                                                                                                                                                                           461
                                                                                                                                                                                                                                        NASKLSWK----IDEEIFSFYKILIKMRK-----ELSIACDRRVNVVNGENWLIIKGR 510
                                                                                                                             |||| | : |: || : || 489 trskldwaeasagdharllelyrslitlrrstpelarIqfa-dtavefdddarwl----
                                                                                                                                                                         PYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQDESTF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Miyake T;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Trehalose-releasing enzyme amino acid sequence.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ŝ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Maruta K, Kubota M, Fukuda
                                                                                                                                                                                                                                                                                                                         |: : |: | : || 543 rywrggvqvvlnfadrpisldrpgtall 570
                                                                                                                                                                                                                                                                                                     511 EYFS----LYVFSKSSIEVKYSGTLLL 533
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               SEIBUTSU KAGAKU
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Claim 29; Page 47-48; 93pp; English.
                                                                                                                                                                                                                                                                                                                                                                                                             AAY85157 standard; protein; 575
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 98JP-0258394.
98JP-0352252.
99JP-0016931.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     99EP-0307220
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Arthrobacter sp. S34
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          WPI; 2000-273225/24.
N-PSDB; AAA10503.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 (HAYB ) HAYASHIBARA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 11-SEP-1998;
11-DEC-1998;
26-JAN-1999;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     13-SEP-1999;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             23-JUN-2000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Yamamoto T,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      EP990704-A2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     05-APR-2000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         production).
                                                                                                                                                                                                                                                                                                                                                                                                                                               AAY85157;
                                                                                                                                                                                                       429
                                                                                                                                                                         409
                                              297
                                                                           315
                                                                                                                                                                                                                                                                                                                                                                                               AAY85157
              셤
                                            à
                                                                           a
                                                                                                           ò
                                                                                                                                        g
                                                                                                                                                                         ð
                                                                                                                                                                                                  qq
                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                  ద
                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                               g
```

```
13;
particularly used for further enzymatic conversion of starch hydrolysate to trehalose. The non-reducing sugars produced by the enzymes are useful in foods, pharmaceuticals and cosmetics. Non-reducing sugars are compatible with amino acids and proteins, they do not cause browning, and have good moisture-retaining properties. The enzymes produce the non-reducing sugars in high yield and function at a medium temperature range i.e. between 40 degrees celsius and 60 degrees celsius, and in an acidic pH range, i.e. a pH of less than 7 Production of non-reducing sugars using the enzymes eliminates the need to convert a starch by decological acidic for sugar alcohols (non-reducing) by catalytic
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                trehalose; disaccharide; food;
moisture retention; cosmetic;
                                                                                                                                                                                                                                                                                                                                                                                                                                             412
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          465
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          dprslrqprgvh----elgrefdparyawgddgwrgrdltgaviyelhvgtftpegtl 116
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      YWIKEYNVDGFRLDAVHAIIDTSPKHILEEIA----DVVHKYNR--IVIAESDLNDPRVV 293
                                                                                                                                                                                                                                                                                                    FTLWAPYQKSVKLKVLEKGLYE--MERDEKGYFTITL---NNVKVRDRYKYVLDDASEIP 68
                                                                                                                                                                                                                                                                                                                       DPASRYQPEGVHGPSQIIQESKEFNNETFLKKED------LIIYEIHVGTFTPEGTF
                                                                                                                                                                                                                                                                                                                                                                                                                             EGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       180 KKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       294 NPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              RRKTHGEPVG-ELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         rerhhgrpldpdipfrrlvafaqdhdqvgnravgdrmsaqvgegslaaaaalvllgpftp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          MIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQDESTFNASK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      LSWKIDEE-----IFSFYKILIKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSK
                                                                                                                                                                                                                                        Length 575;
                                                                                                                                                                                                                                                                     189; Indels
                                                                                                                                                                                                                                       21;
                                                                                                                                                                                                                                     Score 1024.5; DB Pred. No. 1.4e-75; ); Mismatches 189
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Trehalose-releasing enzyme amino acid sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Non-reducing saccharide-forming enzyme; high yield; trehalose releasing enzyme; production.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          AAY85165 standard; Protein; 575
                                                                                                                                                                                                                                                                     90;
                                                                                                                                                                                                                                     34.4%;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        (first entry)
                                                                                                                                                                                                                                                                       Conservative
                                                                                                                                                                                                                                       Query Match
Best Local Similarity
Matches 215; Conserv
                                                                                                                                                                                           AA;
                                                                                                                                                                                           575
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 521 SSIEV 525
                                                                                                                                                            ydrogenation.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                527 gplrv 531
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      23-JUN-2000
                                                                                                                                                                                           Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     240
                                                                                                                                                                                                                                                                                                      14
                                                                                                                                                                                                                                                                                                                                                                69
                                                                                                                                                                                                                                                                                                                                                                                                                            120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   237
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               297
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            354
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           357
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     417
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      991
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          413
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            AAY85165
    8888888888888
                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                               qq
                                                                                                                                                                                                                                                                                                                                                                δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         염
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            d
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
```

us-09-298-924-6.rag

```
ywlrdmhadglrldavhalrdaralhlleelaarvdelagelgrpltliaesdlndpkli 296
                                        294 NPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNF 353
                                                                                                                                                                                                     MIFMGEEYGEENPFYFFSDFSDFSCLIQGVREGRKKE---NGQD----TDPQDESTFNASK 465
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  A gene coding for a thermostable branching enzyme has been isolated from chromosomal DNA of B.stearothermophilus strain TRBE14 and sequenced (see AAT04542). The enzyme (AAR80037) was found to have an activity of 80% or more at up to 65 deg.C
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ţ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        4 AYKIDGNEVI-----FTLWAPYQKSVKL----KVLEKGLYEMER-DEKGYFTITLN 49
                                                             Thermostable branching enzyme gene and recombinant plasmid contg. - used to produced a thermostable branching enzyme
                                                                                                                         RRKTHGEPVG-ELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIP
                                                                                                                                                                                                                                                                                      LSWKIDEE----IFSFYKILIKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                96; Mismatches 189; Indels 158;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        /note= "Met residue corresponds to TTG codon"
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Length 652;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Thermostable; 1,4-alpha-glucan; branching enzyme; amylose;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Bacillus stearothermophilus thermostable branching enzyme
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       DB 16;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       13.4%; Score 399; DB 16; 25.2%; Pred. No. 4.2e-24;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Bacillus stearothermophilus (strain TRBE14).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Location/Qualifiers
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               AAR80037 standard; Protein; 652 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Claim 3; Page 6-12; 14pp; Japanese.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 93JP-0311004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        93JP-0311004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Best Local Similarity 25.29
Matches 149; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   amylopectin; transferase.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                (EZAK ) EZAKI GLICO CO.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    WPI; 1995-315926/41.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            652 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          N-PSDB; AAT04542
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Misc-difference
                                                                                                                                                                                                                                                                                                                                                                     521 SSIEV 525
                                                                                                                                                                                                                                                                                                                                                                                                         gplrv 531
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               04-NOV-1993;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  11-JUL-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 JP07213287-A
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      14-NOV-1993;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         15-AUG-1995,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       AAR80037;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                        12
237
                                                                              297
                                                                                                                                                               357
                                                                                                                                                                                                                                           417
                                                                                                                                                                                                                                                                                    466
                                                                                                                       354
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      셤
                                                                                                                                                         qq
                                                                                                                                                                                                                                           a
                                                                                                                                                                                                                                                                                                                        Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        δλ
                                      δ
                                                                                                                       ò
                                                                                                                                                                                                   òγ
                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                  δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         This sequence represents a trehalose-releasing enzyme amino acid sequence from Arthrobacter sp. S34. This enzyme specifically hydrolyses a non-reducing saccharide having a trehalose structure as an end unit. The invention relates to this enzyme and also to a non-reducing saccharide forming enzyme that forms a non-reducing saccharide having a trehalose structure as an end unit by reducing partial starch hydrolysates. The two enzymes can be used to produce trehalose, a disaccharide consisting of two moles of glucose bound at their reducing residues. The disaccharide is substantially free of reducibility and has moisture retaining abilities. The enzymes are used to produce non-reducing sugars, they are particularly used for further enzymatic conversion of starch hydrolysate to trehalose. The non-reducing sugars are used to produce by the enzymes are useful in foods, pharmaceuticals and cosmetics. Non-reducing sugars are compatible with amno acids and proteins, they do not cause browning, and have good moisture-retaining properties. The enzymes produce the con-reducing sugars in high yield and function at a medium temperature acidic pH range, i.e. a pH of less than 7. Production of non-reducing sugars using the enzymes claiminates the need to convert a starch budge hydrolysate into sugar alcohols (non-reducing) by catalytic
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            13;
                                                                                                                                                                                                                                                                                                                                                                                                    hydrolysate into non-reducing sugars, particularly trehalose, useful as a sweetener in foods, pharmaceuticals and cosmetics -
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    :|| |: ||||||:|| ||: ||| || arglavvqdvvynhlgpsgnhlpdfgpylgsgaantwgdalnldgplsdevrryiidnav 236
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 DPASRYQPEGVHGPSQIIQESKEPNNETFLKKED------LIIYEIHVGTFTPEGTF 119
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       dprslrqprgvh----elgrefdparyawgddgwrgrdltgaviyelhvgtftpegtl 116
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 EGVIRKLDYLKDLGITA1EIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAH 179
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                180 KKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVE 239
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   YWIKEYNVDGFRLDAVHAIIDTSPKHILEEIA----DVVHKYNR--IVIAESDLNDPRVV 293
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         14 FILWAPYQKSVKLKVLEKGLYE--MERDEKGYFTITL---NNVKVRDRYKYVLDDASEIP 68
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               DB 21; Length 575;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       189; Indels
                                                                                                                                                                                                                                                                                                         Miyake T;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        -
::
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Score 1024.5; DB Pred. No. 1.4e-75.0; Mismatches 18
                                                                                                                                                                                                                                                                                                       Kubota M, Fukuda S,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Example 6-2; Page 56-58; 93pp; English.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      -:
-:
-:
                                                                                                                                                                                                                                                            (HAYB ) HAYASHIBARA SEIBUTSU KAGAKU
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       90;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 34.48;
39.48;
                                                                                                                                                                            98JP-0258394.
98JP-0352252.
99JP-0016931.
                                                                                                                                        99EP-0307220.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        _ :::: = = ::::=
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Conservative
                                                                                                                                                                                                                                                                                                     Yamamoto T, Maruta K,
                 Arthrobacter sp. S34
                                                                                                                                                                                                                                                                                                                                               WPI; 2000-273225/24
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      575 AA;
                                                                                                                                                                                                                                                                                                                                                                N-PSDB; AAA10516.
                                                                                                                                        13-SEP-1999;
                                                                                                                                                                                                 11-DEC-1998;
26-JAN-1999;
                                                       EP990704-A2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Query Match
Best Local Simi
Matches 215;
                                                                                                 05-APR-2000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       63
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 240
```

g δ a ò g δ 셤

94JP-0218554.

```
13-SEP-1994;
                                                                                                                                                                                                                                                                                                                                                                                                                                                              261
                                                                                                                                                                                                                                                                                                                                                                                                                               201
                                                                                                                                                                                                                                                                                                                                                                                                                                               207
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              260
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            312
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            101
g
                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                             qq
                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                             음
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            q
                                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                                              δ
                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                    ----EDLIIYEIHVGTF-TPEGTF----EGVIRKLDYLKDLGITAIEIMPIAQFPGKRD 150
                                                                                     206
                                                                                              259
                                                                                                                                                              372 VYIQN------PMIGVGNRGKGERIIKLVDRESYKIAAALYLLSPYI-----PMIFMGEE 419
                                                                                                                                                                                                                             NVKVRDRYKY - - VLDDASEI - - PDPASRYQPEGVHGPSQIIQESK - - EFNNETFLKK - - - 100
                                                                                                                                                   -----DISPKHILEEIADVVHKY--NRIVIAESDLNDPRVVNPKEKCGYNIDAQWVDDF 311
                                                                                                                                                                                   HHSIHAYLTGERQCYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGEPVGELDGCNFV 371
                                                                                                                                                                                                                                                  420 YGEENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEI----- 474
                                                                                                                                                                                                                                                                  ------ wkfedeldwylf 482
                                :|:: | || syelfgahvineggkvgtrfcvwapharevrlvgsfndwdgtdfrlekvndegvwtivvp
                                                                                                                                                                                                                                                                                                                                                                                                      Escherichia coli;
food-additive;
                                                                                     WGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHV--GPEGNYMVKLGP--
                                                                                                                             -YFSQKYKT -- PWGLTFNFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAII----
                                                                                                                                                                                                                                                                                  475 -FSFYKILIKMRKELSIACDRRVNVV-----NGENWLIIKGREYFSLYVF 518
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                309..317
/note= "Conserved amylase sequence"
414..423
/note= "Conserved amylase sequence used to
construct primer AAT27127"
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      t
t
                                                                                                                                                                                                                                                                                           Bacillus stearothermophilus strain TRBE14 (FERM P-13916).
                                                                                                                                                                                                                                                                                                                                                                                                      Starch-branching-enzyme; thermostable; Q-enzyme; starch; amylopectin; glucan; cyclodextrin; food; adhesive; biodegradable plastic.
                                                                                                                                                                                                                                                                                                                                                                                                                                                           238..249
/note= "Conserved amylase
construct primer A
                                                                                                                                                                                                                                                                                                                                                                                                                                                      Location/Qualifiers
                                                                                                                                                                                                                                                                                                                                       AAR96109 standard; Protein; 652 AA
                                                                                                                                                                                                                                                                  ------faqfde------
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    95EP-0250222.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   95JP-0195647
                                                                                                                                                                                                                                                                                                                                                                       (first entry)
                                                                                                                                                                                                                                                                                                                                                                                      Starch-branching-enzyme,
                                                                                                                                                                                                                                                                                                                                                                      20-AUG-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   13-SEP-1995;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   31-JUL-1995;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     EP710674-A2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    08-MAY-1996
                                                                                                                                                                                                                                                                                                                                                       AAR96109;
                                                                                                                                                                                                                                                                                                                                                                                                                                                              Peptide
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Peptide
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Peptide
                     20
                                                                                                    201
                                                                                                                                                   260
                                                    101
                                                                                                                    207
                                                                                     151
                                                                                                                                                                                                   375
                                                                                                                                                                                                                                                                                                                                 AAR96109
                                                   δ
                                                                   g
                                                                                    δ
                                                                                                Q
                                                                                                                                  Q
                                                                                                                                                                Q
                                                                                                                                                                                                  g
                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                ò
                                    g
                                                                                                                  οy
                                                                                                                                                   ò
                                                                                                                                                                                  õ
                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                ŏ
                                                                                                                                                                                                                                                                                               g
```

```
31;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 This sequence represents a thermostable starch- branching-enzyme (C-enzyme, EC-2.4.1.18) from Bacillus stearothermophilus TRBE14 (C-enzyme, EC-2.4.1.18) from Bacillus stearothermophilus TRBE14 (C-enzyme, EC-2.4.1.18) from Bacillus stearothermophilus TRBE14 (C-enzyme, EC-2.4.1.18) from Bacillus are used to construct primers AAT27126-7, which are used in PCR to amplify a fragment of the gene, which is then used as a probe to isolate a construct primers AAT27126-7, which are used in PCR to amplify a construct primer enzyme may be reacted with starch or amylopectin to produce a glucan with a degree of polymerisation of at least 50, with an inner branched cyclic region and an outer branched region. The product is freely soluble in water, forming a low-viscosity solution, is more resistance to degradation than native starch, does not react with proteins and amino acids, and is degraded to glucose in vivo, so is easily digestible. The glucan may be used in foods, beverages, food-additives, adhesives, in cyclodextrin production and as a constant of the constant 
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  50 NVKVRDRYKY--VLDDASEI--PDPASRYQPEGVHGPSQIIQESK--EFNNETFLKK--- 100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       enleghlykyeivtpdggvlfkadpyafyselrphtas-iaydlkgygwndgswkrkkrr 140
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ----EDLIIYEIHVGTF-TPEGTF----EGVIRKLDYLKDLGITAIEIMPIAQFPGKRD 150
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    wgyggtgyyavtsrygtphdfmyfvdrchgagigvimdwypghfckdahglymfdgapty 260
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             -YFSQKYKT--PWGLTFNFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAII---- 259
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 : : | | : : | | : : | | 374 odrlyenpyaveflrklneavfaydpnalmiaedstdwpkvtaptyegglgfnykw--- 374
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       372 VYIQN -----PMIFMGERIIKLVDRESYKIAAALYLLSPYI-----PMIFMGEE 419
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              HHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGEPVGELDGCNFV 371
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  420 YGEENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEI----- 474
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        4 AYKIDGNEVI-----FTLWAPYQKSVKL----KVLEKGLYEMER-DEKGYFTITLN 49
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    :|:: | || ; :|: | :|| ; :|| ; |:| ; syelfgahvineggkvgtrfcvwapharevrlvgsfndwdgtdfrlekvndegvwtivvp 81
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    useful in foods, drinks, adhesives, infusion compsns. etc., readily soluble in water forming solns. of low viscosity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               -----DISPKHILEEIADVVHKY--NRIVIAESDLNDPRVVNPKEKCGYNIDAQWVDDF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            WGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHV - - GPEGNYMVKLGP - -
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              -----rrhvhnqvtfsl----ly
                                                                                                                                                                                                                                                                                                                                                                                                                       New glucan with cyclic, branched core and outer branched region
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      13.4%; Score 399; DB 17; Length 652; 25.2%; Pred. No. 4.2e-24; ive 96; Mismatches 189; Indels 15
                                                                                                   Takaha T;
                                                                                                        ŝ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Okada
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Example A-2; Page 28-31; 50pp; English.
                                                                                                        Ή
                                                                                                   Nakamura
                                                                                             Imanaka T, Nakamura
Terada Y, Yanase M;
(EZAK ) EZAKI GLICO CO LTD.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Conservative
                                                                                                                                                                                                                                                             WPI; 1996-223407/23.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       652 AA;
                                                                                                                                                                                                                                                                                                               N-PSDB; AAT27128
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Best Local Sim
Matches 149;
                                                                                             Fujii K,     1
Takata H,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Query Match
```

```
-LKKEDLIIYEIHVGTF--TPEGTF----EGVIRKLDYLKDLGITAIEIMPIAQFPGKRD 150
                                                          208
                                                                                                                 259
                                                                                                                                                                       311
                                                                                                                                                                                      368
                                                                                                                                                                                                                                                                                   422
                                                                                                                                                                                                                                                                                                   471
                                                                                                                                                                                                                                                                                                                                                                    -----fdewkdledldwnlhdfemhrymhdyfnelialykrskplwqldhspegfqwid 525
                                                                                                                                                                                                                                                                                                                                                                                                  525
                                                                                                                                                                                                                                                                                                                                                                                                                  -----ymecapeyrkhihekmtfsllyayse 414
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        good
                     WGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHV--GPEGNYMVKLGPYF
                                                                                                              SQKYK-----TPWGLTFNFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAII----
                                                                                                                              ---DTSPKH---ILEEIADVVHKYNR--IVIAESDLNDPRVVNPKEKCGYNIDAQWVDDF
                                                                                                                                                                                                                            HHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGEPVGEL---DGC
                                                                                                                                                                                                                                                                                  369 NFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYI-----PMIFMGEEYGE
                                                                                                                                                                                                                                                                                                                                           ENPFYFFSDFSD-SKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKID-----
                                                                                                                                                                                                                                                                                                                                                                                                 ----EEIFSFYKILIKMRKELSIACDRRVNVVNGENWLI-IKGREYFSLYVFSKSSIEV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          This branching enzyme is derived from B.stearothermophilus and is
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Branching enzyme obtd. from Bacillus stearothermophilus - ha
thermostability, for use in modifying starch-like substances
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Branching enzyme; amylaceous substances; transferase; thermostability.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ΰ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Venema
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          enzyme.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          581 qyggsgqvnkkrlktilepyhnqaahve 608
                                                                                                                                                                                                                                                                                                                                                                                                                                                       526 KYSGT------LLLSSNNSFPQHIE 544
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      AAR11271 standard; Protein; 639 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Beldman G,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Disclosure; fig 4; 13pp; English
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       B.stearothermophilus branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              90EP-0202264.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Bacillus stearothermophilus.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         89NL-0002128
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     (COOP-) COOP VERKOOP AVEBE.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Kiel JAKW, Boels JM,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             WPI; 1991-088587/13
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           N-PSDB; AAQ11072
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              22-AUG-1990;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            29-MAY-1991
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         23-AUG-1989;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   27-MAR-1991
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      EP418945-A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 AAR11271;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           15
  86
                                                        151
                                                                                                              209
                                                                                                                                                                                                                          312
                                                                                                                                                                                                                                                      379
                                                                                                                                                                                                                                                                                                                                         423
                                                                                                                                                                                                                                                                                                                                                                     472
                                                                                                                                                                                                                                                                                                                                                                                                 472
                                                                                                                                                                      260
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           AAR11271
                                                                                                                                    g
    Q
                             g
                                                          ŏ
                                                                           g
                                                                                                       οy
                                                                                                                                                                    οy
                                                                                                                                                                                          op
                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                     qq
                                                                                                                                                                                                                                                                                Ω
                                                                                                                                                                                                                                                                                                        Q
                                                                                                                                                                                                                                                                                                                                        Ω
                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                       ö
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                acid bacteria, esp. Lactobacillus plantarum and B. facealis, transformed with an exogenous DNA encoding an enzyme which breaks down an oligosaccharide and/or a polysaccharide into a fermentable carbohydrate. The exogenous enzyme is especially an alpha-amylase (AAP94635) encoded by the DNA sequence in AAN91246 (claims 2, 6 and 10). The transformed lactic acid bacteria can break down polysaccharides and oligosaccharides in a silage crop to provide a complete source of the fermentable carbohydrates that the lactic acid bacteria need for producing lactic acid. Also claimed is a probictic characterised by the transformed lactic acid bacteria which can be used for establishing and maintaining optimal intestinal flora in animals, including humans.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              29;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Josson K;
  -wkfedeldwvlf 482
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ::: : ||| :: | || :| :| :| hieegeiykyaietlagdvilkadpyavyaevrpntasvvfdikgyewndknwnrkkkk 144
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        AYKIDGNEVI-----FTLWAPYQKSVK-LKVLEKGLYEMER----DEKGYFTITLN 49
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    84
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 97
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       :|| | | : | : | : : : synifgahvvtedeiggvrftvwaphakamsvvgdfnewdyeghkmlqvteegiwslfip
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                NVKVRDRYKYVLD----DASEIPDPASRYQPEGVHGPSQIIQ-ESKEFNNETF-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      The inventors claim an inoculum for silage which comprises lactic
                                                                                                                                                                                                                                                   Lactobacillus plantarum; E. faecalis;
Bacillus thuringiensis strain H1.1 serotype H1 var thuringiensis.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Indels 131;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  DB 10; Length 648;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Ø
                           475 -FSFYKILIKMRKELSIACDRRVNVV------NGENWLIIKGREYFSLYVF 518
                                          | :: : | || ||| :| dfelhrkmndymkel-iacykrykpfyeldhdpggfewldvhnaeq-sifsf 532
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Transformed lactic acid bacteria -
using exogenous DNA hich codes enzyme that breaks down
oligosaccharide and/or polysaccharide, used in silage or as
probiotic
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Platteeuw C,
                                                                                                                                                                                                                                         Alpha-amylase; silage; probiotic; lactic acid bacteria;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Query Match 12.9%; Score 385.5; DB 10; Best Local Similarity 23.7%; Pred. No. 5.3e-23; Matches 149; Conservative 117; Mismatches 231;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Joos H,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Fig 2; pages 2/35-3/35; 112pp; English.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Delcour J, Mahillon J,
                                                                                                                            Ą.
                                                                                                                                                                                                                                                                                                                                                                                                                                       (PLAN-) PLANT GENETIC SYST (UYLO-).
                                                                                                                          AAP94635 standard; protein; 648
                                                                                                                                                                                                            B. thuringiensis alpha-amylase.
                                                                                                                                                                                                                                                                                                                                                                                 88WO-EP00813.
                                                                                                                                                                                                                                                                                                                                                                                                            87EP-0401972
                                                                                                                                                                                  (first entry)
                                                                                                                                                                                                                                                                                              Bacillus thuringiensis
 --faqfde-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             WPI; 1989-085544/11.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        648 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           N-PSDB; AAN91246
                                                                                                                                                                                                                                                                                                                                                                               02-SEP-1988;
                                                                                                                                                                                                                                                                                                                                                                                                           02-SEP-1987;
                                                                                                                                                                                29-JUN-1990
                                                                                                                                                                                                                                                                                                                         WO8901970-A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Michiels F,
                                                                                                                                                                                                                                                                                                                                                     09-MAR-1989
                                                                                                                                                      AAP94635
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Sequence
 465
                                                       483
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   25
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                20
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          85
                                                                                             셤
                                                     용
                           ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ద
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                à
```

```
29;
                                                                                                                                                                                                                                                                                                                                                                                        300 GYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHG 359
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | :|:
|enleghl-----ykyeittndgnvllksdpyafyselrphtasivynikgygw 129
                                                                                                                                                                                                                                                                                                                                                                  93 NNETFLKK-----EDLIIYEIHVGTF--TPEGTF----EGVIRKLDYLKDLGITAIE 138
                                                                                                                                                                                                                                                                                                                                                                                                                                     139 IMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHV--GP 196
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       EGNYMVKLGPYF ----SQKYKTPWGLTFNFDDAESDEVRKFILENVEYWIKEYNVDGFR 251
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           LDAVHAII------DTSPKHILEEIADVVHKY--NRIVIAESDLNDPRVVNPKEKC 299
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 368 glgfnykw-----tymetppehrkyvhn 399
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 360 EPVGELDGCNFVVYIQN-----HDQVGNRGKGERIIKLVDRESYKIAAAL----YLLS- 408
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     409 PYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSW 468
encoded by the glgB gene. It is stable at high temps. and can be produced in large amts. using recombinant techniques. It is a transferase allowing formation of alpha(1-6) branches in starch-like substances. It is useful for extending the shelf life of such materials and can be used in the prepn. of human and animal foods.
                                                                                                                                                                                               Gaps
                                                                                                                                                                                                                                                :|:: | || :|:: : |:| | 2. syelfgahvikkngmvgtrfcvwapharevrlvgsfnewngtnfnlmkvsnggvwmifip 81
                                                                                                                                                                                                                                                                                                E--KGYFTITLNNVKVRDRYKYVL--DDASEI--PDPASRYQPEGVHGPSQIIQ-ESKEF 92
                                                                                                                                                                                                                              4 AYKIDGNEVI------FTLWAPYQKSVKL--------KVLEKGLYEMERD 39
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      469 KIDEEIFSFYKILIKMRKELSIACDRRVNVV-----NGENWLIIKGREYFSLYVF 518
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          12.6%; Score 374.5; DB 12; Length 639; 23.6%; Pred. No. 4.2e-22; tive 99; Mismatches 190; Indels 167;
                                                                                                                                                        Query Match
Best Local Similarity 23.6 Matches 141; Conservative
                                                                                                       639 AA;
                                                                                                           Sequence
                                                                                                                                                                                                                                                                                                  40
                                                                                                                                                                                                                                                                                                                                  82
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       197
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             252
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        481
   8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              셤
                                                                                                                                                                                                                                                              셤
                                                                                                                                                                                                                                                                                                õ
                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                 á
                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  õ
```

Search completed: July 15, 2002, 12:17:32 Job time: 69 sec

```
GenCore version 4.5

Copyright (c) 1993 - 2000 Compugen Ltd.

OM protein - protein search, using sw model

Run on: July 15, 2002, 12:16:28; Search time 25:09 Seconds

(without alignments)
544.197 Million cell updates/sec

Title: US-09-298-924-6

Perfect score: 2978
Sequence: 1 MTFAYKIDGNEVIFTLWAPY......PQHIEEGKVEFDKGFALYKL 559

Scoring table: BLOSUM62
Gapop 10.0, Gapext 0.5

Searched: 231628 seqs, 24425594 residues

Total number of hits satisfying chosen parameters: 231628

Minimum DB seq length: 200000000

Maximum DB seq length: 200000000

Post-processing: Maximum Match 100%
Listing first 45 summaries
```

Pred. No. is the number of results predicted by chance to have a score greater than or equal to the score of the result being printed, and is derived by analysis of the total score distribution.

1: /cgn2_6/ptodata/2/iaa/5A_COMB.pep:*
2: /cgn2_6/ptodata/2/iaa/5B_COMB.pep:*
3: /cgn2_6/ptodata/2/iaa/6A_COMB.pep:*
4: /cgn2_6/ptodata/2/iaa/6E_COMB.pep:*
5: /cgn2_6/ptodata/2/iaa/PCTUS_COMB.pep:*
6: /cgn2_6/ptodata/2/iaa/pCTUS_COMB.pep:*

Issued_Patents_AA:*

Database

SUMMARIES

		-																										
	Description	Sequence 15, Appl	1, 4	1,	Sequence 1, Appli	14,	14,	Sequence 14, Appl	14,	4, A	4	4	4,	2,	7	Sequence 2, Appli	Sequence 2, Appli	Sequence 12, Appl	12,	Sequence 12, Appl	Sequence 12, Appl	4	6	Sequence 10, Appl	Sequence 2, Appli	4	7	2,
SUMMARIES	ΠD	US-09-242-690A-15	US-08-505-377-1	US-08-798-269-1	US-09-055-210-1	US-08-399-646-14	US-08-607-321-14	US-08-961-240-14	US-08-605-501-14	US-08-399-646-4	US-08-607-321-4	US-08-961-240-4	US-08-605-501-4	US-08-399-646-2	US-08-607-321-2	US-08-961-240-2	US-08-605-501-2	US-08-399-646-12	US-08-607-321-12	US-08-961-240-12	US-08-605-501-12	US-08-528-026C-4	US-09-346-237-9	US-09-346-237-10	US-09-187-124-2	US-09-514-302-4	US-09-514-302-2	US-08-410-784A-2
	DB	4	7	٣	4	Ţ	-	7	~	٦	Н	7	7	Н	Н	7	7	-4	-	7	7	4	4	4	4	4	4	7
	Query Match Length	559	556	556	556	298	598	598	298	597	597	597	597	589	589	589	589	296	596	296	296	652	713	718	909	893	1938	818
æ	Query	100.0	58.7	58.7	58.7	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	13.4	11.6	11.5	11.2	11.1	11.1	11.1
	Score	2978	1748.5	1748.5	1748.5	1060.5	1060.5	1060.5	1060.5	1059	1059	1059	1059	1025	1025	1025	1025	1025	1025	1025	1025	399	346.5	343	334	331.5	331.5	329.5
	Result No.	J	7	n	4	ς.	9	7	80	o.	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

Sequence 11, Appl Sequence 6, Appli Sequence 1, Appli Sequence 3, Appli Sequence 3, Appli Sequence 2, Appli Sequence 2, Appli Sequence 11, Appl Sequence 3, Appli Sequence 3, Appli Sequence 3, Appli	OF PRODUCING PROTEINS USING THE COLLEGE AND ACTED ACTED AND ACTED AND ACTED AND ACTED ACTE	14; Length 559; 250; 0; Indels 0; Gaps 0; 0; Indels 0; Gaps 0; 11
4 US-09-346-237-11 2 US-08-410-784A-4 4 US-09-514-599-6 4 US-08-039-777-3 1 US-08-013-377-3 1 US-08-01-31A-3 4 US-09-514-599-2 4 US-09-514-599-4 4 US-09-514-599-4 1 US-08-474-10-11 1 US-08-47-10-11 1 US-08-47-10-11 1 US-08-47-11 2 US-08-47-11 3 US-08-996-73-11 1 US-08-37-002A-3 3 US-08-537-002A-3 4 US-08-537-002A-3 4 US-08-537-002A-3	ALIGNMENTS 09242690A ECTOR AND METHOD OF US/09/242,690A 02-23 T/JP97/02924 22 23/JP97/02924 23/JP97/02924 23/JP97/02924 24/J062 P 8/241062 P 8/241062 C	108; Score 2978; DE 108; Pred. NO. 4.1e- 108; Pred. NO. 4.1e- 108; Pred. NO. 4.1e- 109; Mismatches 111111111111111111111111111111111111
329.5 11.1 818 321.5 10.8 740 303.5 10.2 829 293.5 9.9 555 293.5 9.9 555 291 9.8 928 286 9.6 928 286 9.6 928 286 9.6 928 286 9.6 928 286 9.6 928 286 9.6 928 286 9.6 928 286 9.6 928 286 9.6 928 286 9.6 928 286 9.6 928 286 9.6 928 286 9.6 928 286 9.6 928	AA-15 6284534 6284534 FORMATION: KONDO, KEIJI MIURA, YUTA NUVENTION: YEA RENCE: 049441/ PELICATION NUMBE LICATION NUMBE LICATION NUMBE RENCE: 1996 SECO ID NOS: 6 Patentin Ver. 1559 AALIÉCIAI S CORMATION: Des	go, , , , , , , , , , , , , , , , , , ,
20000000000000000000000000000000000000	RESULT 1 US-09-242-69(Sequence 15 Sequence 16 Separation No. FERENT NO. TITLE OF 7 SEQ ID NO 7 SOFTWARE: SEC	Ouery best Lc Matches Qy 1 Qy 61 Qy 121 Qy 121 Qy 121 Qy 121 Qy 181 Qy 181 Db 121 Db 181 Db 181 Db 181 Db 181

```
62
                                                                                Matches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         302
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  362
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               482
                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                           δy
                                                                                                                                                                                                                                                                                                                                                  Óγ
                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                         ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     qq
                                                                                                                                                                                                             420
                                                                                                                                                           420
  YNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGE 360
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              APPLICANT: SUGIMOTO, TOSHLYUKI
TITLE OF INVENTION: RECOMBINANT THERMOSTABLE ENZYME WHICH
TITLE OF INVENTION: RELEASES TREHALOSE FROM NON-REDUCING SACCHARIDE
NUMBER OF SEQUENCES: 19
                                                                                                                                     PVGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEY
                                                                                                                                                                                                                                                                                                                      LIKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy disk
COMPUTER: THEN PC COMPATIBLE
COMPUTER: THEN PC COMPATIBLE
COMPUTER: THEN PC COMPATIBLE
COMPUTER: PATENTING SYSTEM: PC-DOS/MS-DOS
SOFTWARE: PATENTIN Release #1.0, Version #1.30
CLASSIFICATION NUMBER: US/08/505,377
FILING DATE: 21-ULL-1995
CLASSIFICATION DATA:
APPLICATION DATA:
APPLICATION NUMBER: JP 190180/1994
FILING DATE: 11-APR-1995
FILING DATE: 11-APR-1995
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP 109128/1995
FILING DATE: 11-APR-1995
ATTOR APPLICATION DATA:
APPLICATION NUMBER: JP NOT YET RECEIVED
FILING DATE: 04-JUL-1995
ATTORNEY/AGENT INPORMATION:
ANAMER: DATAGET TOWNERMINGERIALION:
ANAMER: DATAGET TOWNERMINGERIA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      E: Browdy and Neimark 419 Seventh Street N.W. Ste. 300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           REFERENCE/DOCKET NUMBER: MITSUZUMI=1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Sequence 1, Application US/08505377
Patent No. 5856146
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            MITSUZUMI, Hitoshi
KUBOTA, Michio
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       TELECOMMUNICATION INFORMATION
                                                                                                                                                                                                                                                                                                                                                                                                                                                           541 QHIEEGKYEFDKGFALYKL 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                (202) 628-5197
(202) 737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               TELEX: 249688
INFORMATION FOR SEQ ID NO: 1:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  : 556 amino acids
amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         NAME: Browdy, Roger L
REGISTRATION NUMBER: 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ; TOPOLOGY: linear
; MOLECULE TYPE: protein
US-08-505-377-1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          CORRESPONDENCE ADDRESS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         20004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               STREET: 419 Seve
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      GENERAL INFORMATION:
APPLICANT: MITSUZ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     TELEPHONE:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ADDRESSEE:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 STATE: D
COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          APPLICANT:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              TELEFAX:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            RESULT 2
US-08-505-377-1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  LENGTH:
301
                                                                                                      361
                                                                                                                                                                                                                                                                                                                      481
                                                 8
                                                                                                                                                     a
                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                               q
                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                qq
                                                                                                                                                                                                                                                                                                                                                                                                                          ð
```

```
ŝ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          480 INIRKRYN-NCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGI--GFPK 536
                                                                                                                                                                                                      DDASEIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDLIIYEIHVGTFTPEGTFEG 121
                                                                                                                                                                                                                                                                                                        122 VIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKK 181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           242 IKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEKCGY 301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                NIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGEP 361
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    VGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYG 421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    360 VGDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYY 419
                                                    Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Sequence 1, Application US/08798269
Patent No. 6027918
GENERAL INCORMATION:
APPLICANT: MITSUZUMI, Hitoshi
APPLICANT: KUBOTA, Michio
APPLICANT: RUBOTA, Michio
APPLICANT: RUBOTA, Michio
APPLICANT: RUBOTA, Michio
TITLE OF INVENTION: RECAMBINANT THERMOSTABLE ENZYME WHICH
TITLE OF INVENTION: RELEASES TREHALOSE FROM NON-REDUCING SACCHARIDE
                                                                                                                                 3 SFGCNIEKKNGIFKLWAPYVNSVKLK-LSKKLIPMEKNDEGFFFVEIDDIEENLTYSYII 61
                                                                                                 2 TFAYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVL 61
                                                                                                                                                                                                                                                                                                                                                                                                          182 GLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYW
                                                                                                                                                                                                                                                                                                                                                                                                                                       242 FKTFKIDGLKLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIV--KDDCGY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      EENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFYKIL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           IKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFPQ
                                                  7;
  Length 556;
                                                  Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             OF DEACHTING SYSTEM: PG-DOS/MS-DOS SOFTWARE: PATENTIN Release #1.0, Version #1.30 CURRENT APPLICATION DATA: APPLICATION NUMBER: US/08/798,269 FILING DATE:
; Score 1748.5; DB 2;
; Pred. No. 1.9e-143;
87; Mismatches 136;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ADDRESSEE: Browdy and Neimark
STREET: 419 Seventh Street N.W. Ste. 300
58.7%;
58.9%;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          542 HIEEGK-YEFDKGFALYKL 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          537 KLKKDELIKVNRGVGVYQL 555
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Floppy disk
                                                  Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ZIP: 20004
COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       NUMBER OF SEQUENCES: 1
CORRESPONDENCE ADDRESS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           CITY: Washington STATE: D.C.
                       Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                U.S.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              COUNTRY:
                                                  329;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         US-08-798-269-1
Query Match
Best Local S
```

```
APPLICANT: MITSUZUMI, Hitoshi
APPLICANT: KUBOTA, Michio
APPLICANT: KUBOTA, Michio
APPLICANT: SUGIMOTO, TOShiyuki
TITLE OF INVENTION: RECOMBINANT THERMOSTABLE ENZYME WHICH
TITLE OF INVENTION: RELEASES TREHALOSE FROM NON-REDUCING SACCHARIDE
NUMBER OF SEQUENCES: 19
CORRESPONDENCE ADDRESS:
ADDRESSEE: Browdy and Neimark
STREET: 419 Seventh Street N.W. Ste. 300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                62 DDASEIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDLIIYEIHVGTFTPEGTFEG 121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       182 GLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYW 241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          3 SFGGNIEKNKGIFKLWAPYVNSVKLK-LSKKLIPMEKNDEGFFEVEIDDIEENLTYSYII 61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       2 TFAYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVL 61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               DB 4; Length 556;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           58.7%; Score 1748.5; DB 4; Length 58.9%; Pred. No. 1.9e-143; ive 87; Mismatches 136; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                           SOFTWARE: PatentIn Release #1.0, Version #1.30
CURRENT APPLICATION DATA:
APPLICATION NUMBER: US/09/055,210
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  CLASSIFICATION:
PRIOR APPLICATION DATA:
APPLICATION NUMBER: 08/505,377
FILING DATE: 21-JUL-1995
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP 109128/1995
FILING DATE: 11-APR-1995
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP NOT YET RECEIVED
FILING DATE: 04-JUL-1995
ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         REFERENCE/DOCKET NUMBER: MITSUZUMI=1 TELECOMMUNICATION INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                     COMPUTER: IBM PC compatible OPERATING SYSTEM: PC-DOS/MS-DOS
                                       Sequence 1, Application US/09055210 Patent No. 6346394
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                TELEX: 249688
INFORMATION FOR SEQ ID NO: 1:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               TELEPHONE: (202) 628-5197
TELEFAX: (202) 737-3528
                                                                                                                                                                                                                                                                                                                                                                       Floppy disk
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              LENGTH: 556 amino acids
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Best Local Similarity 58.9
Matches 329; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   NAME: Browdy, Roger L
REGISTRATION NUMBER: 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  , MOLECULE TYPE: protein US-09-055-210-1
                                                                                                                                                                                                                                                                                                                             ZIP: 20004
COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                amino acid
                                                                                                                                                                                                                                                                        Washington
                                                                                                                                                                                                                                                                                                              U.S.A.
                                                                               GENERAL INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        FILING DATE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  TOPOLOGY:
                                                                                                                                                                                                                                                                                                              COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                TELEFAX:
       RESULT 4
US-09-055-210-1
                                                                                                                                                                                                                                                                                            STATE:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            δý
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           122 VIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNBAHKR 181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      482 IKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFPQ 541
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  122 VIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKK 181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    182 GLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYW 241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              242 IKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEKCGY 301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         302 NIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGEP 361
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 362 VGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYG 421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            EENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFYKIL 481
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    2 TFAYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVL 61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           DB 3; Length 556;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        58.7%; Score 1748.5; DB 3; Length
58.9%; Pred. No. 1.9e-143;
tive 87; Mismatches 136; Indels
                                                                                         PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP 109128/1995
FILING DATE: 11-APPR.1995
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP NOT YET RECEIVED
FILING DATE: 04-JUL-1995
ATTORNEY/AGENT INFORMATION:
NAME: BIOWDY, ROGER L
REGISTRATION NUMBER: 25,618
                                                                                                                                                                                                                                                                    REFERENCE/DOCKET NUMBER: MITSUZUMI=1
TELECOMMUNICATION INFORMATION:
                                                       APPLICATION NUMBER: JP 190180/1994
FILING DATE: 21-JUL-1994
                   US/08/505,377
                                                                                                                                                                                                                                                                                                          TELEPHONE: (202) 628-5197
TELEFAX: (202) 737-3528
TELES: 24968
INFORMATION FOR SEQ ID NO: 1:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       537 KLKKDELIKVNRGVGVYQL 555
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 542 HIEEGK-YEFDKGFALYKL 559
                                       FILING DATE: 21-JUL-1995
                                                                                                                                                                                                                                                                                                                                                                                 SEQUENCE CHARACTERISTICS:
LENGTH: 556 amino acids
TYPE: amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Conservative
PRIOR APPLICATION DATA:
APPLICATION NUMBER: 1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                 MOLECULE TYPE: protein
                                                                                                                                                                                                                                                                                                                                                                                                                                                   linear
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Query Match
Best Local Similarity
Matches 329; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                                                               TOPOLOGY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  US-08-798-269-1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            422
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ď
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  φ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
```

ŝ

Gaps

```
APPLICANT: KUBOTA, Michio
APPLICANT: TSUSAKI, Keiji
APPLICANT: HATTORI, Kazuko
APPLICANT: SUGIMOTO, TOSHIJUKI
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               221 NFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRI 280
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              102 -DLIIYEIHVGTFTPEGTFEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYA 160
                                                                                                                                                                                                                                                                                                                                                                                                                       335 DIVKSYKDVFVYDGKYSNFRRKTHGEPVGELDGCNF------VVYIQNHDQVGNRGKG 386
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRK 446
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               447 KE---NGQD----TDPQDESTFNASKLSWKIDEE----IFSFYKILIKMRKELSIAC-- 492
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        469 KEFERMGWDPAVVPDPQDPETFRRSKLDWAEAAEGDHARLLELYRSLTALRRSTPDLTKL 528
                                                                                                                                                                                                                                       47 --TLNNVKVRDRYKYVLD-DASEIPDPASRYQPEGVHGPSQIIQESK-EFNNETFLKKE- 101
                                                                                                                                                                                                                                                                                                                                                         115 QGAVIYELHLGTFTPEGTLEAAAGKLDYLAGLGVDFIELLPVNAFNGTHNWGYDGVQWFA 174
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           281 V-----IAESDLNDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLD 334
                                                                                                                                                           1 MTFAYKIDGNEVI-----FTLWAPYQKSVKLKVLEKG-LYEMER------DEKGYFTI-- 46
                                                                                                                                                                               161 VQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTF
                                                                              Length 598;
                                                                          35.6%; Score 1060.5; DB 1; Length 39.7%; Pred. No. 1e-83; ive 92; Mismatches 197; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | :| || || 572 | GFEDTQVAFDEDARWLRFRRGGVQVLLNFSEQPVSLDGAGTALL 572
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               493 --- DRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC COMPATIBLE
OPERATING SYSTEM: PC-DOS/MS-DOS
SOFTWARE: PatentIn Release #1.0, Version #1.30
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ADDRESSEE: BROWDY AND NEIMARK
STREET: 419 Seventh Street, N.W., Suite 300
CITY: Washington
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Sequence 14, Application US/08607321
Patent No. 5716813
                                                                                               Best_Local Similarity 39.79
Matches 232; Conservative
protein
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 NUMBER OF SEQUENCES: 1
CORRESPONDENCE ADDRESS:
ADDRESSEE: BROWDY AN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               GENERAL INFORMATION:
  MOLECULE TYPE:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    STATE: D.C. COUNTRY: USA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         20004
      ; MULECULE 111
US-08-399-646-14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 US-08-607-321-14
                                                                              Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    387
                                                                                                                                                           ò
                                                                                                                                                                                              g
                                                                                                                                                                                                                                       δ
                                                                                                                                                                                                                                                                          엄
                                                                                                                                                                                                                                                                                                                    ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  QQ
                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          GENERAL INFORMATION:
APPLICANT: KUBOTA, Michio
APPLICANT: TSUSAKI, Kelji
APPLICANT: TSUSAKI, Kelji
APPLICANT: HATTORI, Kazuko
APPLICANT: HATTORI, Kazuko
APPLICANT: BYGIMOTO, TOSHIYUKI
TITLE OF INVENTION: DNA BNCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
NUMBER OF SEQUENCES: BOTORICS:
ADDRESSE: BROWDY AND NEIMARK
STREET: 419 Seventh Street, N.W., Suite 300
CITY: Washington
                  301
                                                                                               361
                                                                                                                   482 IKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFPQ 541
                                                                                                                                                                                                                                                                                                                                                             VGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYG 421
                                                                                                                                                                                                                                                          EENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFYKIL 481
                                 242 IKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEKCGY
                                                                                          302 NIDAQWVDDFHHSIHAYLIGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRTHGEP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SOFTWARE: Patentin Release #1.0, Version #1.30 CURRENT APPLICATION DATA:
APPLICATION NUMBER: US/08/399,646 FILING DATE: 07-MAR-1995
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               KUBOTA=5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC compatible
OPERATING SYSTEM: PC-DOS/MS-DOS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Sequence 14, Application US/08399646 Patent No. 5556781
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    CLASSIFICATION: 435
CLASSIFICATION: 435
PRIOR APPLICATION DATA:
FILING DATE: 07-MAR-1994
PRIOR APPLICATION DATA:
APPLICATION DATA:
APPLICATION DATA:
ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  NAME: BROWDY, ROGER L. REGISTRATION NUMBER: 25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     REFERENCE/DOCKET NUMBER: KU
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
TELEFAX: 202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     TELEX: 248633
INFORMATION FOR SEQ ID NO: 14:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                 542 HIEEGK-YEFDKGFALYKL 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                      537 KLKKDELIKVNRGVGVYQL 555
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   : 598 amino acids
amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          <u>0</u>
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         20004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      TOPOLOGY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    US-08-399-646-14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 LENGTH:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 CITY: W
                                                                                                                                                                         362
                                                                                                                                                                                                                                                        422
                                                   g
                                                                                                                                                                                                                                                                                           q
                                                                                                                                                                                                                                                                                                                                                                       QQ
                                                                                                                                셤
                                                                                                                                                                         å
                                                                                                                                                                                                                음
                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                    ð
                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
```

```
APPLICANT: KUBOTA, Michio
APPLICANT: TSUGAKI, Kelji
APPLICANT: TSUGAKI, KAZUKO
APPLICANT: HTTORI, KAZUKO
APPLICANT: SUGIMOTO, TOSHLYUKI
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
NUMBER OF SEQUENCES: 18
CORRESPONDENCE ADDRESS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        --TLNNVKVRDRYKYVLD-DASEIPDPASRYQPEGVHGPSQIIQESK-EFNNETFLKKE- 101
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       102 -DLIIYEIHVGTFTPEGTFEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYA 160
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  115 QGAVIYELHLGTFTPEGTLEAAAGKLDYLAGLGVDFIELLPVNAFNGTHNWGYDGVQWFA 174
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            1 MTFAYKIDGNEVI-----FTLWAPYQKSVKLKVLEKG-LYEMER------DEKGYFTI-- 46
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Query Match 35.6%; Score 1060.5; DB 2; Length 598; Best Local Similarity 39.7%; Pred. No. 1e-83; Matches 232; Conservative 92; Mismatches 197; Indels 63;
                                                                                                                                                                                                                                                                                                                                                                                                                                     OPERATING SYSTEM: PC-DOS/MS-DOS
SOFTWARE: PatentIn Release #1.0, Version #1.30
CARRENT APPLICATION DATA:
                                                                                                                                                                                                                                    STREET: 419 Seventh Street, N.W., Suite 300 CITY: Washington STATE: D.C.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             PRIOR APPLICATION DATA:
APPLICATION NUMBER: US 08/399,646
FILING DATE: 07-MAR-1995
APPLICATION NUMBER: JF 59834
FILING DATE: 07-MAR-1994
PRIOR APPLICATION NUMBER: JF 59840
FILING DATE: 07-MAR-1994
ATTORNEY/AGENT INFORMATION:
NAME: BROWDY, ROGER L.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          APPLICATION NUMBER: US/08/961,240
FILING DATE: 30-OCT-1997
                                                        Sequence 14, Application US/08961240 Patent No. 5830715
                                                                                                                                                                                                                                                                                                                                                                                         COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC compatible
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
TELEFAX: 202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     REFERENCE/DOCKET NUMBER:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        LENGTH: 598 amino acids TYPE: amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            NAME: BROWDY, ROGER L. REGISTRATION NUMBER: 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           TELEX: 248633
INFORMATION FOR SEQ ID NO:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                MOLECULE TYPE: protein
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            FILING DATE: 30 CLASSIFICATION:
                                                                                                                                                                                                                                                                                                                                                                     20004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            TOPOLOGY:
                                      US-08-961-240-14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 US-08-961-240-14
                                                                                                                                                                                                                                                                                                                                                     COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Óγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Dp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       16;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    355 ALAKVLRDGFFFHDGSYSSFRERHHGRPI-----NFSAVHPAALVVCSQNHDQIGNRATG 408
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRK 446
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  47 --TLNNVKVRDRYKYVLD-DASEIPDPASRYQPEGYHGPSQIIQESK-EFNNETFLKKE- 101
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            102 -DLIIYEIHVGTFTPEGTFEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYA 160
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         161 VQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTF 220
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    221 NFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRI 280
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     V-----IAESDINDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLD 334
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                DIVKSYKDVFVYDGKYSNFRKTHGEPVGELDGCNF-----VVYIQNHDQVGNRGKG 386
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             KEFERMGWDPAVVPDPQDPETFRRSKLDWAEAAEGDHARLLELYRSLTALRRSTPDLTKL 528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           1 MTFAYKIDGNEVI-----FTLWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTI-- 46
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      KE---NGQD----TDPQDESTFNASKLSWKIDEE----IFSFYKILIKMRKELSIAC--
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Length 598;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               35.6%; Score 1060.5; DB 1; Length 39.7%; Pred. No. 1e-83; Live 92; Mismatches 197; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    --- DRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLL 533
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | :| || : : :|| || 529 GFEDTQVAFDEDARWLRFRRGGVQVLLNFSEQPVSLDGAGTALL 572
                                                                  PRICE APPLICATION PATA:
APPLICATION NUMBER: US 08/399,646
FILING DATE: 07-MAR-1995
APPLICATION NUMBER: UP 59834
FILING DATE: 07-MAR-1994
PRIOR APPLICATION DATA:
APPLICATION NUMBER: UP 59840
FILING DATE: 07-MAR-1994
ATTORNEY/AGENT INFORMATION:
NAME: BROWNY, ROGET L.
REGISTRATION NUMBER: 25,618
      линей: US/08/607,321
26-FEB-1996
                                                                                                                                                                                                                                                                                          KUBOTA=5
                                                                                                                                                                                                                                                                                      REFERENCE/DOCKET NUMBER: KU
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
TELEFAX: 202-737-3528
                                                                                                                                                                                                                                                                                                                                                                   TELEX: 248633
INFORMATION FOR SEQ ID NO: 14:
                                                                                                                                                                                                                                                                                                                                                                                                         SEQUENCE CHARACTERISTICS:
LENGTH: 598 amino acids
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Query Match
Best Local Similarity 39.7's
Matches 232; Conservative
CURRENT APPLICATION DATA:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    MOLECULE TYPE: protein
                  APPLICATION NUMBER:
FILING DATE: 26-FEE
                                                                                                                                                                                                                                                                                                                                                                                                                                                  amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      linear
                                                      CLASSIFICATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  TOPOLOGY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        US-08-607-321-14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              235
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       281
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                335
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 409
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         447
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      493
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             õ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ö
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
```

Gaps

```
amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                STREET:
                                                                                            Query Match
Best Local S
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             STATE:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      335
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    387
                                                                                                                                                                                                                                                                                                                                                        161
                                                                                                                                                             ò
                                                                                                                                                                                           g
                                                                                                                                                                                                                          ŏ
                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                          õ
                                                                                                                                                                                                                                                                                                                      ρp
                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                       a
                                                                                                                                                                                                                                                                                                                                                                                                                         δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                APPLICANT: KUBOTA, Michio
APPLICANT: TSUGAKI, Keiji
APPLICANT: TSUGAKI, Keiji
APPLICANT: HTTORI, Kazuko
APPLICANT: SUGIMOTO, Toshiyuki
APPLICANT: SUGIMOTO, TOSHIYUKi
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
NUMBER OF SEQUENCES: IN
                           281 V------IAESDLNDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLD 334
                                                                                           335 DIVKSYKDVFVYDGKYSNFRKTHGEPVGELDGCNF-----VVYIQNHDQVGNRGKG 386
                                                                                                                                                         ERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRK 446
                                                                                                                                                                                                                          447 KE---NGOD----TDPQDESTFNASKLSWKIDEE----IFSFYKILIKMRKELSIAC-- 492
                                                                                                                                                                                                                                                                                                    469 KEFERMGWDPAVVPDPQDPETFRRSKLDWAEAAEGDHARLLELYRSLTALRRSTPDLTKL 528
          NFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRI
                                                                                                                                                                                                                                                                                                                                      --- DRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLL 533
                                                                                                                                                                                                                                                                                                                                                                  529 GFEDTQVAFDEDARWLRFRRGGVQVLLNFSEQPVSLDGAGTALL 572
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     COMPUTER: IBM PC COMPALIZATION CONTRACTING SYSTEM: PC-DOS/MS-DOS SOFTWARE: Patentin Release #1.0, Version #1.30 CURRENT APPLICATION DATA: US/08/605,501 FILING DATE: 26-FEB-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             E: BROWDY AND NEIMARK
419 Seventh Street, N.W., Suite 300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        PRICE APPLICATION 473.

APPLICATION NUMBER: US 08/399,646
FILING DATE: 07-MAR-1995
APPLICATION NUMBER: JP 59834
FILING DATE: 07-MAR-1994
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP 59840
FILING DATE: 07-MAR-1994
ATTORNEY, AGENT INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            KUBOTA=5
                                                                                                                                                                                                                                                                                                                                                                                                                                                  Sequence 14, Application US/08605501 Patent No. 5834287 GENERAL INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            E: Floppy disk
IBM PC compatible
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         REFERENCE/DOCKET NUMBER: KU
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 TELEX: 248633
INFORMATION FOR SEQ ID NO: 14:
SEQUENCE CHARACTERISTICS:
LENGTH: 598 amino acids
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         NAME: BROWDY, ROGER L. REGISTRATION NUMBER: 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               CORRESPONDENCE ADDRESS:
ADDRESSEE: BROWDY AN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               STREET: 419 Sever CITY: Washington STATE: D.C.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               STATE: D.C.
COUNTRY: USA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               20004
                                                                                                                                                                                                                                                                                                                                                                                                                                   US-08-605-501-14
                                                                                                                                                                                                       387
          ò
                                      g
                                                                      ò
                                                                                                     g
                                                                                                                                       οŽ
                                                                                                                                                                   g
                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                     ŏ
                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                  셤
```

```
16;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              APPLICANT: KUBOTA, Michio
APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Keiji
APPLICANT: HATTONI, KEZUKO
APPLICANT: SUGIMOTO, TOSHIYUKI
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
CORRESSONDENCES: BROWDY AND NEIMARK
ADDRESSEE: BROWDY AND NEIMARK
                                                                                                                                                                                                                                                                                                                                                                                      102 -DLIIYEIHVGTFTPEGTFEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYA 160
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               VQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTF 220
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       NFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRI 280
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRK 446
                                                                                                                                                                                                                                                                                               47 --TLNNVKVRDRYKYVLD-DASEIPDPASRYQPEGVHGPSQIIQESK-EFNNETFLKKE- 101
                                                                                                                                                                                                                                                                                                                                                                                                                V-----IAESDLNDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLD 334
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     1 MTFAYKIDGNEVI-----FTLWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTI-- 46
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     59 APTDGNVD----YGYLLDGDETPLPDPRTRRQPDGVHALSRTFDPSAYSWQDDAWGGREL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               447 KE---NGQD----TDPQDESTFNASKLSWKIDEE----IFSFYKILIKMRKELSIAC--
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               DIVKSYKDVFVYDGKYSNFRRKTHGEPVGELDGCNF-----VVYIQNHDQVGNRGKG
                                                                                                                                                             63;
                                                                                                                 Length 598;
                                                                                                                                                           92; Mismatches 197; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         493 --- DRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLL 533
                                                                                                                 DB 2;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 E: BROWDY AND NEIMARK
419 Seventh Street, N.W., Suite 300
                                                                                                                                      Pred. No. 1e-83;
                                                                                                              35.6%; Score 1060.5; 39.7%; Pred. No. 1e-6
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Sequence 4, Application US/08399646
Patent No. 5556781
GENERAL INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ZIP: 20004
COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC COMPATIble
                                                                                                                                                           Matches 232; Conservative
; TOPOLOGY: linear
; MOLECULE TYPE: protein
US-08-605-501-14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                CITY: Washington
                                                                                                                                      Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 US-08-399-646-4
```

```
APPLICANT: SUGIMOTO, TOSHİYUKİ
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             131
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               119 FEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEA 178
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     -DASEIPDPASRYQPEGVHGPSQIIQESK-EFNNETFLKKE--DLIIYEIHVGTFTPEGT 118
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     14 FTLWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTI----TLNNVKVRDRYKYVLD 62
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           58;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Length 597;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            35.6%; Score 1059; DB 1; Length 59 40.5%; Pred. No. 1.4e-83; 1.1ve 89; Mismatches 190; Indels
                                                                                                                                                                                                                                                                                                                                                       COMPOTER READABLE FORM:
MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC compatible
OPERATING SYSTEM: PC-DOS/MS-DOS
SOFTWARE: PatentIn Release #1.0, Version #1.30
                                                                                                                                                                                                                                                  E: BROWDY AND NEIMARK
419 Seventh Street, N.W., Suite 300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     PRIOR APPLICATION DATA:
APPLICATION NUMBER: US 08/399,646
FILING DATE: 07-MAR-1995
APPLICATION NUMBER: UP 59834
FILING DATE: 07-MAR-1994
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             KUBOTA-5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   APPLICATION NUMBER: US/08/607,321
FILING DATE: 26-FEB-1996
CLASSIFICATION: 435
                                                  Sequence 4, Application US/08607321 Patent No. 5716813
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              FILING DATE: 07-MAR-1994
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JF 59840
FILING DATE: 07-MAR-1994
ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        REFERENCE/DOCKET NUMBER: KU
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
TELEFAX: 202-737-3528
                                                                                                        APPLICANT: TSUSAKI, Keiji
APPLICANT: HATTORI, Kazuko
APPLICANT: SHGTMONT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     597 amino acids
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Query Match 35.6%
Best Local Similarity 40.5%
Matches 229; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                  CURRENT APPLICATION DATA:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  NAME: BROWDY, ROGER L. REGISTRATION NUMBER: 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             TELEX: 248633
INFORMATION FOR SEQ ID NO:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       protein
                                                                                                                                                                                                               NUMBER OF SEQUENCES: 1
CORRESPONDENCE ADDRESS:
                                                                                                                                                                                                                                                                                    Washington
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    TOPOLOGY: linear
                                                                                       GENERAL INFORMATION:
APPLICANT: KUBOTA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ; MOLECULE TYPE:
US-08-607-321-4
                                                                                                                                                                                                                                                  ADDRESSEE:
STREET: 41
                                                                                                                                                                                                                                                                                                                                          20004
                                                                                                                                                                                                                                                                                                                           COUNTRY:
              RESULT 10
US-08-607-321-4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      LENGIH:
                                                                                                                                                                                                                                                                                                    STATE:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          63
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Dp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            οχ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               15;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   63 -DASEIPDPASRYQPEGVHGPSQIIQESK-EFNNETFLKKE--DLIIYEIHVGTFTPEGT 118
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             FEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEA 178
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             179 HKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENV 238
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  239 EYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIV-----IAESDLNDPRV 292
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         293 VNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSN 352
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              FRRKTHGEPVGELDGCNF-----VVYIQNHDQVGNRGKGERIIKLVDRESYKIAAAL 404
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              486 PETPRRSKLDWAEAAEGDHARLLELYRSLTALRRSTPDLTKLGFEDTQVAFDEDARWLRF 545
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     YLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQD 457
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ESTFNASKLSWKIDEE----IFSFYKILIKMRKELSIAC-----DRRVNVVNGENWLII 507
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              14 FTLWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTI----TLNNVKVRDRYKYVLD 62
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              18 YDVWAPNAESVTL--LAGGERYAMQRRAETGPEDAGWWTAAGAPTDGNVD----YGYLLLD 71
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Length 597;
             SOFTWARE: PatentIn Release #1.0, Version #1.30 CURRENT APPLICATION DATA:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     35.6%; Score 1059; DB 1;
40.5%; Pred. No. 1.4e-83;
tive 89; Mismatches 190;
                                                APPLICATION NUMBER: US/08/399,646 FILING DATE: 07-MAR-1995 CLASSIFICATION: 435
                                                                                                                                                                                                                                                                     KUBOTA=5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 KGREYFSLYVFSKSSIEVKYSGTLLL 533
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   546 RRGGVQVLLNFSEQPVSLDGAGTALL 571
OPERATING SYSTEM: PC-DOS/MS-DOS
                                                                                               PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP 59834
FILING DATE: O7-MAR-1994
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP 59840
FILING DATE: O7-MAR-1994
ATTORNEY/AGENT INFORMATION:
NAME: BROWNY, ROGET L.
REGISTRATION NUMBER: 25,618
                                                                                                                                                                                                                                                             REFERENCE/DOCKET NUMBER: KUI
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
TELEFA: 202-737-3528
TELEX: 248633
INFORMATION FOR SEQ ID NO: 4:
                                                                                                                                                                                                                                                                                                                                                                                            : 597 amino acids amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Conservative
                                                                                                                                                                                                                                                                                                                                                                             SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                  protein
                                                                                                                                                                                                                                                                                                                                                                                                                                   Linear
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Query Match
Best Local Similarity
Matches 229; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                                                                MOLECULE TYPE:
                                                                                                                                                                                                                                                                                                                                                                                                                                TOPOLOGY:
                                                                                                                                                                                                                                                                                                                                                                                            LENGIH:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   US-08-399-646-4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        119
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      252
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           312
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              353
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  372
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 909
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          οŽ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            9
```

us-09-298-924-6.rai

Page

```
; TOPOLOGY: linear
; MOLECULE TYPE: protein
US-08-961-240-4
                                                                                                                                                                                                                                                                                                                                                      179
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       158
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       353
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      486
                                                                                                                                                    δ
                                                                                                                                                                                   q
                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                    ŏ
                                                                                                                                                                                                                                                                                    ð
                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                  ŏ
                                                                                                                                                                                                                                                                                                                                                                                   a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                       δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                     qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              APPLICANT: KUBOTA, Michio
APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Keiji
APPLICANT: HATTORI, Kasuko
APPLICANT: HATTORI, TSALINA
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
NUMBER OF SEQUENCES: 18
CORRESPONDENCE ADDRESS:
ADDRESSE: BROWDY AND NEIMARK
STREET: 419 Seventh Street, N.W., Suite 300
   --IAESDLNDPRV 292
             VNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSN 352
                                                                                 ESTFNASKLSWKIDEE-----IFSFYKILIKMRKELSIAC-----DRRVNVVNGENWLII 507
                                                                                                                               FRRKTHGEPVGELDGCNF-----VVYIQNHDQVGNRGKGERIIKLVDRESYKIAAAL 404
                                                                                                                                                                                              405 YLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQD 457
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC compatible
OPERATING SYSTEM: PC-DOS/MS-DOS
SOFTWARE: Patentin Release #1.0, Version #1.30
CURRENT APPLICATION DATA:
APPLICATION NUMBER: US/08/961,240
FLING DATE: 30-OCT-1997
CLASSIFICATION 1435
PRIOR APPLICATION NUMBER: US 08/399,646
FILING DATE: 07-MAR-1995
APPLICATION NUMBER: US 58344
FILING DATE: 07-MAR-1994
PRIOR APPLICATION NUMBER: US 59834
FILING DATE: US-MAR-1994
PRIOR APPLICATION NUMBER: US-MAR-1994
PRIOR APPLICATION NUMBER: US-MAR-1994
EYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIV --
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          KUBOTA-5
                                                                                                                                                                                                                                                                                                                                 508 KGREYFSLYVFSKSSIEVKYSGTLLL 533
                                                                                                                                                                                                                                                                                                                                                       : :|| || || RRGGVQVLLNFSEQPVSLDGAGTALL 571
                                                                                                                                                                                                                                                                                                                                                                                                                                                 Sequence 4, Application US/08961240 Patent No. 5830715 GENERAL INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    APPLICATION NUMBER: JP 59840
FILING DATE: 07-MAR-1994
ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 REGISTRATION NUMBER: 25,618
REGISTRATION NUMBER: 25,618
REFERENCE/FOCKET NUMBER: KU
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     TELEX: 248633
INFORMATION FOR SEQ ID NO: 4:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     597 amino acids
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                CITY: Washington
STATE: D.C.
COUNTRY: USA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   20004
                                                                                                                                                                                                                                                                                                                                                                                                                                  US-08-961-240-4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     LENGTH:
                                                                                                                                                                                                                                                                                                                                                                  546
                                                              293
                                                                                               312
                                                                                                                               353
                                                                                                                                                                                                                                                                 458
                             g
                                                              ò
                                                                                         g
                                                                                                                               ð
                                                                                                                                                             g
                                                                                                                                                                                          ŏ
                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                               õ
                                                                                                                                                                                                                                                                                             쉽
                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                Ω
```

```
15;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          APPLICANT: KUBOTA, Michio
APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Keiji
APPLICANT: HATTORI, Kazuko
APPLICANT: SUGIMOTO, Toshiyuki
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT, DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
                                                                                                                                                                                63 -DASEIPDPASRYQPEGVHGPSQIIQESK-EFNNETFLKKE--DLIIYEIHVGTFTPEGT 118
                                                                                                                                                                                                            119 FEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEA 178
                                                                                                                                                                                                                                                                                                 HKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENV 238
                                                                                                                                                                                                                                                                                                                                                                                       239 EYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIV-----IAESDLNDPRV 292
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               293 VNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSN 352
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 FRRKTHGEPVGELDGCNF-----VVYIQNHDQVGNRGKGERIIKLVDRESYKIAAAL 404
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    PETFRRSKLDWAEAAEGDHARLLELYRSLTALRRSTPDLTKLGFEDTQVAFDEDARWLRF 545
                                                   Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     405 YLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQD 457
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ESTFNASKLSWKIDEE-----IFSFYKILIKMRKELSIAC-----DRRVNVVNGENWLII 507
                                                                                        14 FTLWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTI----TLNNVKVRDRYKYVLD 62
                                                                                                                   58;
      Length 597;
                                                Indels
; Score 1059; DB 2;
; Pred. No. 1.4e-83;
89; Mismatches 190;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          E: BROWDY AND NEIMARK 419 Seventh Street, N.W., Suite 300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                508 KGREYFSLYVFSKSSIEVKYSGTLLL 533
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          546 RRGGVQVLLNFSEQPVSLDGAGTALL 571
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Sequence 4, Application US/08605501
Patent No. 5834287
GENERAL INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    COMPUTER: IBM PC compatible
    35.6%;
                                              Matches 229; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        COMPUTER READABLE FORM: MEDIUM TYPE: Floppy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              NUMBER OF SEQUENCES: 1
CORRESPONDENCE ADDRESS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        CITY: Washington STATE: D.C.
    Query Match
Best Local Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ADDRESSEE:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       US-08-605-501-4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               STREET:
```

```
APPLICANT: KUBOTA, Michio
APPLICANT: TSUSAKI, Keiji
APPLICANT: HATTORI, Kazuko
APPLICANT: SUGIMOTO, TOSHIJUKI
APPLICANT: SUGIMOTO, TOSHIJUKI
TITLE OF INVENTION: DNA BNCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  LGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWI 242
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        123 IRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKG 182
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            128 AGKLDYLAGLGIDFIELLPVNAFNGTHNWGYDGVQWFAVHEGYGGPAAYQRFVDAAHAAG 187
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             66 EIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDL---IIYEIHVGTFTPEGTFEGV 122
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               14 FILWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTITLNNVKVRDRYKYVLD-DAS 65
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     62;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   34.4%; Score 1025; DB 1; Length 589;
40.3%; Pred. No. 1.2e-80;
ive 80; Mismatches 197; Indels 6
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  SCEWART APPLICATION DATA:
CURRENT APPLICATION DATA:
APPLICATION NUMBER: US/08/399,646
FILING DATE: O7-MAR-1995
CLASSIFICATION 435
PRIOR APPLICATION DATA:
APPLICATION NUMBER: UP 59834
FILING DATE: 07-MAR-1994
PRIOR APPLICATION DATA:
APPLICATION NUMBER: UP 59840
FILING DATE: 07-MAR-1994
ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                                                                                                                                                                              419 Seventh Street, N.W., Suite
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 KUBOTA=5
    546 RRGGVQVLLNFSEQPVSLDGAGTALL 571
                                                                                                                                                                                                                                                                                                                                                                                                                          COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC compatible
OPERATING SYSTEM: PC-DOS/M9-DOS
                                                                                                Sequence 2, Application US/08399646 Patent No. 5556781
                                                                                                                                                                                                                                                                                                              BROWDY AND NEIMARK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
TELEFAX: 202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           NAME: BROWDY, ROGER L.
REGISTRATION NUMBER: 25,
REFERENCE/DOCKET NUMBER:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 TELEX: 24633
INFORMATION FOR SEQ ID NO: SEQUENCE CHARACTERISTICS: LENGTH: 589 amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Best Local Similarity 40.3
Matches 229; Conservative
                                                                                                                                                                                                                                                                      NUMBER OF SEQUENCES: 1:
CORRESPONDENCE ADDRESS:
ADDRESSEE: BROWDY ANI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       MOLECULE TYPE: protein
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       amino acid
                                                                                                                                                                                                                                                                                                                                                    Washington
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           linear
                                                                                                                                      GENERAL INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                          USA
                                                                                                                                                                                                                                                                                                                                                                                                        20004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       TOPOLOGY:
                                                                                                                                                                                                                                                                                                                                                                    STATE: D
COUNTRY:
                                                                                                                                                                                                                                                                                                                              STREET:
CITY: Wa
                                                                              US-08-399-646-2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             US-08-399-646-2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Query Match
    qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               15;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           63 -DASEIPDPASRYQPEGVHGPSQIIQESK-EFNNETFLKKE--DLIIYEIHVGTFTPEGT 118
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     119 FEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEA 178
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 HKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENV 238
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     192 HAAGLGVIQDVVYNHLGPSGNYLPRFGPYLKQGEGNTWGDSVNLDGPGSDHVRRYILDNL 251
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         126 TLTGPFTPMLLMGEEYGASTPWQFFTSHPEPELGKATAEGRIKEFERMGWDPAVVPDPQD 485
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                239 EYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIV-----IAESDLNDPRV 292
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             293 VNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSN 352
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               FRRKTHGEPVGELDGCNF-----VVYIQNHDQVGNRGKGERIIKLVDRESYKIAAAL 404
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           405 YLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQD 457
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        158 ESTFNASKLSWKIDEE----IFSFYKILIKMRKELSIAC-----DRRVNVVNGENWLII 507
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   14 FTLWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTI----TLNNVKVRDRYKYVLD 62
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         58;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Length 597;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             89; Mismatches 190; Indels
OPERATING SYSTEM: PC-DOS/MS-DOS
SOFTWARE: PatentIn Release #1.0, Version #1.30
CURRENT APPLICATION DATA:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      DB 2;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Score 1059; DB 2;
Pred. No. 1.4e-83;
                                                                                                        PURDATE APPLICATION DATA:
APPLICATION NUMBER: US 08/399,646
FILING DATE: 07-MAR-1995
APPLICATION UNBER: UP 59834
FILING DATE: 07-MAR-1994
                                                                                                                                                                                                                                                                                                                                  KUBOTA-5
                                                      UMBER: US/08/605,501
26-FEB-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  508 KGREYFSLYVFSKSSIEVKYSGTLLL 533
                                                                                                                                                                                        FILING DATE: 07-MAR-1994
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JF 5940
FILING DATE: 07-MAR-1994
ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                                                                                                                                        NAME: BROWDY, Roger L. REGISTRATION NUMBER: 25,618
                                                                                                                                                                                                                                                                                                                            REFERENCE/DOCKET NUMBER: KU
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
TELEFAX: 202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      35.6%;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  LENGTH: 597 amino acids
TYPE: amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Matches 229; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                    TELEX: 248633
INFORMATION FOR SEQ ID NO:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ; MOLECULE TYPE: protein US-08-605-501-4
                                                          APPLICATION NUMBER:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Local Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        linear
                                                                          FILING DATE: 26 CLASSIFICATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 353
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               179
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ö
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       οχ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
```

```
511 EYFS----LYVFSKSSIEVKYSGTLLL 533
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             536 RYWRGGVQVVLNFADRPISLDRPGTALL 563
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          BROWDY AND NEIMARK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC compatible
                                                                                                                                                                                     Query Match
Best Local Similarity 40.39
Matches 229; Conservative
                       ; TOPOLOGY: linear
; MOLECULE TYPE: protein
US-08-607-321-2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy
amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ADDRESSEE:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  RESULT 15
US-08-961-240-2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        STATE:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     183
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  243
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        409
                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                         Óχ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Óγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                            δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  pp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Sequence 2. Application US/08607321

Patent No. 5716813

GENERAL INFORMATION:
APPLICANT: KUBOTA, Michio
APPLICANT: TSUSAKI, Keiji
APPLICANT: HATTORI, Kazuko
APPLICANT: SUGIMOTO, TOSHIYUKi
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
NUMBER OF SEQUENCES: 18
CORRESPONDENCE ADDRESS:
ADDRESSES: BROWDY AND NEIMARK
STREET: 419 Seventh Street, N.W., Suite 300
                                                                                                                                                                                               THGEPVGELDGCNF-----VVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLS 408
                                                                                                                                                                                                                                                                                                                                                                                                                       461
                                                                                                                                                                                                                                                                                                                                                                                                                                                         STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEM
                                                                                                                                                          EKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRK 356
                                                                                                                                                                                                                                                                                                                         PYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQDESTF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       NASKLSWK----IDEEIFSFYKILIKMRK-----ELSIACDRRVNVVNGENWLIIKGR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    482 TRSKLDWAEASAGDHARLLELYRSLITLRRSTPELARLGFA-DTAVEFDDDARWL----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC Compatible
OPERATING SYSTEM: PC-DOS/MS-DOS
SOFTWARE: Patentin Release #1.0, Version #1.30
CURRENT APPLICATION DATA:
APPLICATION NUMBER: US/08/607,321
FILING DATE: 26-FEB-1996
CLASSIFTCATION: 435
PRIOR APPLICATION DATA:
APPLICATION NUMBER: US 08/399,646
FILING DATE: 07-MAR-1995
APPLICATION NUMBER: US 08/399,646
FILING DATE: 07-MAR-1995
APPLICATION NUMBER: US 08/399
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                511 EYFS----LYVFSKSSIEVKYSGTLLL 533
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                536 RYWRGGVQVVLNFADRPISLDRPGTALL 563
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP 59840
FILING DATE: O7-KAR-1994
ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              NAME: BROWNY, ROGER L. REGISTRATION NUMBER: 25,618
REFERENCE/DOCKET NUMBER: KU TELECOMMUNICATION: INFORMATION: 202-628-5197
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           TELEX: 248633
INFORMATION FOR SEQ 1D NO: 2: SEQUENCE CHARACTERISTICS: LENGTH: 589 amino acids
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   COMPUTER READABLE FORM: MEDIUM TYPE: Floppy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    STATE: D.C.
COUNTRY: USA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    20004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             US-08-607-321-2
                                                                                       248
                                                                                                                                                                                                                    308
                                                                                                                                                                                                                                                                                       357
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       462
                                                                                                                                                                                                                                                                                                                                                                                                                    409
                                                                                                                                                    297
                                                                                    a
                                                                                                                                                                                                             QQ
                                                                                                                                                                                                                                                                                    ç
                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
```

```
16;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Sequence 2, Application US/08961240
Patent No. 5830715
GENERAL INFORMATION:
GENERAL INFORMATION:
APPLICANT: KUBOTA, Michio
APPLICANT: HATTORI, Kazuko
APPLICANT: SUGINOTO, TOSALYUKi
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: BUZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
NUMBER OF SEQUENCES: 18
CORRESPONDENCE ADDRESS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             EKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRK 356
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                408
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 461
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  481
                                                                                                                                                                                                           66 EIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDL---IIYEIHVGTFTPEGTFEGV 122
                                                                                                                                                                                                                                                                                                                                        128 AGKLDYLAGLGIDFIELLPVNAFNGTHNWGYDGVQWFAVHEGYGGPAAYQRFVDAAHAAG 187
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            KEYNVDGFRLDAVHAIIDTSPKHILEE---IADVVHKYN---RIVIAESDLNDPRVVNPK 296
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         462 NASKLSWK----IDEEIFSFYKILIKMRK-----ELSIACDRRVNVVNGENWLIIKGR 510
                                                           Gaps
                                                                                                                                          14 FILWAPYOKSVKLKVLEKG-LYEMER-----DEKGYFTITLNNVKVRDRYKYVLD-DAS 65
                                                                                                                                                                                                                                     123 IRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKG
                                                                                                                                                                                                                                                                                                                                                                                                               LGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWI
                                                                                                                                                                                                                                                                                                                                                                                                                                         357 THGEPVGELDGCNF-----VVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 PYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQDESTF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   482 TRSKLDWAEASAGDHARLLELYRSLITLRRSTPELARLGFA-DTAVEFDDDARWL----
                                                         62;
       Length 589;
34.4%; Score 1025; DB 1; Length 5 40.3%; Pred. No. 1.2e-80; Live 80; Mismatches 197; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               STREET: 419 Seventh Street, N.W., Suite 300 CITY: Washington
```

```
243 KEYNVDGFRLDAVHAIIDTSPKHILEE---IADVVHKYN----RIVIAESDLNDPRVVNPK 296
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       357 THGEPVGELDGCNF-----VVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLS 408
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        EIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDL---IIYEIHVGTFTPEGTFEGV 122
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 123 IRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKG 182
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       LGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWI 242
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 EKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRK 356
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    PYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQDESTF 461
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              248 RDYRVDGLRLDAVHALKDERAVHILEEFGALADALSSEGGRPLTLIAESDLNNPRLLYPR 307
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Query Match 34.4%; Score 1025; DB 2; Length 589; Best Local Similarity 40.3%; Pred. No. 1.2e-80; Matches 229; Conservative 80; Mismatches 197; Indels 62; Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       14 FTLWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTITLNNVKVRDRYKYVLD-DAS 65
           SOFTWARE: Patentin release #1.0, Version #1.30 CURRENT APPLICATION DATA: APPLICATION UMBER: US/08/961,240 FILING DATE: 30-OCT-1997 CLASSIFICATION: 435
                                                                                                CLASSIFLATION: 43.2
PRIOR SAPELICATION DATA.
APPLICATION NUMBER: US 08/399,646
FILING DATE: 07-MAR-1994
APPLICATION NUMBER: JP 59834
FILING DATE: 07-MAR-1994
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP 59840
FILING DATE: 07-MAR-1994
ATTORNEY/AGENT INFORMATION:
NAME: BROWDY, ROGER L.
REGISTRATION NUMBER: 25,618
REGISTRATION NUMBER: 25,618
                                                                                                                                                                                                                                                                                                                        KUBOTA=5
OPERATING SYSTEM: PC-DOS/MS-DOS
                                                                                                                                                                                                                                                                                                                  REFERENCE/DOCKET NUMBER: KUT
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
TELEFAX: 202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                  SEQUENCE CHARACTERISTICS:
LENGTH: 589 amino acids
TYPE: amino acid
                                                                                                                                                                                                                                                                                                                                                                                              TELEX: 248633
INFORMATION FOR SEQ ID NO:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ; MOLECULE TYPE: protein US-08-961-240-2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 linear
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           TOPOLOGY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        99
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               297
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  308
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  409
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     422
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  õ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               qq
```

òγ

511 EYFS----LYVFSKSSIEVKYSGTLLL 533

16;

Db 536 RYWRGGVQVVLNFADRPISLDRPGTALL 563

Search completed: July 15, 2002, 12:18:04 Job time: 96 sec

```
July 15, 2002, 12:16:28 ; Search time 32.43 Seconds (without alignments) 1656.304 Million cell updates/sec
                                                                                                                                                                           US-09-298-924-6
2978
1 MIFAYKIDGNEVIFTLWAPY......PQHIEEGKYEFDKGFALYKL
version 4.5 - 2000 Compugen Ltd.
                                                                                                                                                                                                                                                                                                                                          of hits satisfying chosen parameters:
                                                                                                                                                                                                                                                                                                        283138 seqs, 96089334 residues
                                                                                                                                                                                                                                                                                                                                                                                                                                   Post-processing: Minimum Match 0%
Maximum Match 100%
Listing first 45 summaries
                                                                     OM protein - protein search, using sw model
                                                                                                                                                                                                                                                     BLOSUM62
Gapop 10.0 , Gapext 0.5
GenCore
Copyright (c) 1993
                                                                                                                                                                                                                                                                                                                                                                              Minimum DB seq length: 0
Maximum DB seq length: 200000000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           PIR_71:*
1: pir1:*
2: pir2:*
3: pir3:*
4: pir4:*
                                                                                                                                                                                              Perfect score:
Sequence:
                                                                                                                                                                                                                                                     Scoring table:
                                                                                                                                                                                                                                                                                                                                            rotal number
                                                                                                                                                                                                                                                                                                          Searched:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Database
                                                                                                      Run on:
```

Pred. No. is the number of results predicted by chance to have a score greater than or equal to the score of the result being printed, and is derived by analysis of the total score distribution.

ö

Gaps

; 0

Length 558; Indels

Score 2973; DB 2; Pred. No. 1.1e-185; 0; Mismatches 0;

Query Match 99.8%; Sc Best Local Similarity 100.0%; P Matches 558; Conservative 0; 61 DDASEIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDLIIYEIHVGTFTPEGTFEG 120

62 DDASEIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDLIIYEIHVGTFTPEGTFEG 121

쉽

qq

òγ

g

οy

Ω

122 VIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKK 181

181

g

182 GLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYW 241

360

301

NIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGEP 361

302

QY

g

g

δ

g

οy

		dР			SUMMARIES	
Result No.	Score	Query	Length	60	ID	Description
1	2973			n	JC5135	9
7	2467		561	~	0	-amylase (
٣	1748.5		556	N	JC5132	alpha-amylase (EC
4	1288.5		620	N	AH1827	a
5	1060.5	•	298	~	865770	maltooligosyltreha
9	1025		596	7	JC4697	trehalose trehaloh
7	1024.5	34.4	575	~	JC7727	malto-oligosyltreh
80	997.5		580	~	G70763	probable maltoolig
6	978.5		594	~	AI0673	probable hydrolase
10	905.5	30.4	900	~	H75516	
11	881.5	•	583	7	G83375	
12	876.5		601	7	D96001	probable 1,4-alpha
13	860.5		595	~	AG3194	alpha-amylase Atu5
14	524.5		552	7	S19134	probable alpha-glu
15	524.5		552	~	AH1915	hypothetical prote
16	391		999	7	B56639	1,4-alpha-qlucan b
17	374.5		627	-	S40048	1,4-alpha-glucan b
18	374.5		638	7	S18599	1,4-alpha-glucan b
19	365		1280	7	E95031	alkaline amylopull
20	364		1256	~	G97902	alpha-amylase (EC
21	361	•	630	~	D70363	1,4-alpha-qlucan b
22	349.5	•	783	~	B84823	probable isoamylas
23	348.5		999	7	E71565	
24	347.5		764	~	AG1895	
25	345.5		422	~	S31839	1,4-alpha-qlucan b
26	345.5		664	7	B86539	coden
27	45.		9	7	B72084	
28	345.5		999	7	G81717	
29	45.		0	7	70	

30 344.5 11.6 741 1 S 31 343 11.5 718 2 S 32 340 11.4 730 1 I 34 33.5 11.4 789 2 T 34 33.5 11.2 764 2 S 36 33.5 11.2 764 2 S 37 334.5 11.2 720 2 B 39 333.5 11.2 720 2 B 39 333.5 11.2 720 2 B 39 333.5 11.2 720 2 B 40 330.5 11.1 818 2 T 42 320.5 11.0 735 2 F 44 327.5 11.0 735 2 F 45 326.5 11.0 735 2 A RESULT CC5135 CC5135 CC5135 CC5136 Sulfolobus solfarations	344.5 344.5 346.5 33.6 33.6 33.6 33.6 33.7 33.6 33.7 32.9 32.5 32.6 32.6 32.6 32.6 32.6 32.6 32.6 32.6	(EC	11111111111111111111111111111111111111	741 7189 7089 7089 7089 7002 717 720 720 733 733 735 603 735	Sulf	30 344.5 11.6 741 1 S34218 31 343 11.5 718 2 S73088 32 340 11.4 730 1 164118 34 339.5 11.4 789 2 701321 35 339.5 11.4 789 2 701321 36 335 11.2 762 2 885091 37 334.5 11.2 777 2 848122 38 333.5 11.2 777 2 875095 40 330.5 11.1 562 2 C82263 41 329.5 11.1 562 2 C82263 42 329 11.0 733 2 T49679 43 327.5 11.0 735 2 P8228 44 325.5 11.0 603 2 AC0674 5556555 55565658 50160bus solfatarious	1,4-alpha-glucan b glycogen operon pr 1,4-alpha-glucan b probable isoamylas isoamylas isoamylas lyamylase-like pr 1,4-alpha-glucan b alkaline amylopull pullulanase amyx [glycogen operon pr hypothetical prote trahalose 6-phosph probable isoamylas probable isoamylas probable branching 1,4-alpha-glucan b glycogen branching probable glycogen probable glycogen branching combable glycogen branching glycogen branching probable glycogen
C, species, satisfications Solitate allows (C) Date: 31-Jan-1997 #sequence_revision C; Accession: JC5135 R; Kobayashi, K.; Kato, M.; Miura, Y.; K Blosci. Biotechnol. Biochem. 60, 1882-18, Title: Gene cloning and expression of A; Reference number: JC5134; MUID: 971416 A; Status: pre-liminary A; Molecule proc. Days	31-Jar 31-Jar 31-Jar ashi, k Biotec Gene sion: J	11997 7C5135 7C5135 7C5135 Chnol. cloni nmber: 7C5135	# se # se rto, Bio, JC5.	quence quence M.; Mir chem. Chem. Ind exp:	rev res 50, ress	C.Date: 31-Jan 1997 #sequence_revision 27-Feb-1997 C.Accession: JC5135 E.Robayashi, K.; Kato, M.; Miura, Y.; Kettoku, M.; Richayashi, K.; Kato, M.; Miura, Y.; Kettoku, M.; Blosci. Biochem. 60, 1882-1885, 1996 A.Fitle: Gene cloning and expression of new trehalk A.Reference number: JC5134; MUID:97141610 A.Accession: JC5135 A.Accession: JC5135 A.Moleoning trees.	27-Feb-1997 #text_change 20-Jun-2000 ettoku, M.; Komeda, T.; Iwamatsu, A. 885, 1996 i new trehalose-producing enzymes from the hype 10
A)Residues: 1758 < CKOB> A)Cross-references: DBBJ:D64130; A)Experimental source: strain KMI C)Comment: This enzyme hydrolyzes C;Superfamily: trehalose trehaloh C;Keywords: glycosidase; hydrolas	refere refere lmental nt: Thi family:	558 < snces: L sour Ls enz : treh	<pre><kob> <kob> if DDB. complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete complete compl</kob></kob></pre>	J:D64130; N strain KM1 hydrolyzes e trehalohy ; hydrolase	30; KM1 Yzes aloh	A;Residues: 1.558 <kob> A;Cross references: DbBJ:D64130; NID:9987702; PIDN:BAA11010.1; A;Experimental source: strain KM1 A;Experiment: This enzyme hydrolyzes starch alpha-1,4 linkage adja C;Superfamily: trehalose trehalohydrolase C;Superfamily: trehalose; hydrolase</kob>	A;Residues: 1-558 <kob> A;Cross-references: DDBJ:D64130; NID:g987702; PIDN:BAA11010.1; PID:g1838936 A;Experimental source: strain KM1 C;Comment: This enzyme hydrolyzes starch alpha-1,4 linkage adjacent to the alpha-1,1 C;Superfamily: trehalose trehalohydrolase C;Reywords: glycosidase; hydrolase</kob>

~

archaea

```
Nifiternate names: glycogenase.
C.Species: Sulfolobus acidocaldarius
C.Species: Sulfolobus acidocaldarius
C.Species: Sulfolobus acidocaldarius
C.Species: Sulfolobus acidocaldarius
C.Saccession: JC5132
R.Kobayashi, K.: Kato, M.; Miura, Y.; Kettoku, M.; Komeda, T.; Iwamatsu, A.
Biosci. Biotechnol. Biochem. 60, 1720-1723, 1996
A;Title: Gene analysis of trehalose-producing enzymes from hyperthermophilic arc
A;Reference number: JC5131; MUID:97141330
A;Reference number: JC5132
A;Status: preliminary; nucleic acid sequence not shown
A;Wolecule type: DNA
A;Residues: 1-556 <KOB
A;Cross-references: DBBJ:D64131; NID:9987704; PIDN:BAA11011.1; PID:9987705
A;Cross-references: DBBJ:D64131; NID:9987704; PIDN:BAA11011.1; PID:9987705
C;Comment: This enzyme hydrolyzes glycosyltrehalose to liberate trehalose.
C;Superfamily: trehalose trehalohydrolase
C;Keywords: glycosidase; hydrolase
                                                                                                                                                                                                                                                                             hyperthermophilic
359
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                479
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    361
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 481
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                536
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         VIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  TFAYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        INIRKRYN-NCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGI--GFPK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      DDASEIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDLIIYEIHVGTFTPEGTFEG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     GLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYW
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    242 IKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEKCGY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    NIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRKTHGEP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   VGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  IKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFPQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 EENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFYKIL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         7;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           556;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Length
                                                                                                                                                             alpha-amylase (EC 3.2.1.1) - Sulfolobus acidocaldarius
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        58.7%; Score 1748.5; DB 2
58.9%; Pred. No. 4.5e-106;
Live 87; Mismatches 136;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     537 KLKKDELIKVNRGVGVYQL 555
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                HIEEGK-YEFDKGFALYKL 559
                                                                 FPSQITESKYELDKGFALYKL
                                               FPQHIEEGKYEFDKGFALYKL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Query Match
Best Local Simi
Matches 329;
               481
                                             539
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      62
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       62
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     122
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    182
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  182
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 360
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                482
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  302
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 122
               g
                                             óλ
                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                d
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                 Alpha-amylase (EC 3.2.1.1) precursor - Sulfolobus solfataricus
alpha-amylase (EC 3.2.1.1) precursor - Sulfolobus solfataricus
N;Alternate names: protein c0620
C;Species: Sulfolobus solfataricus
C;Species: Sulfolobus solfataricus
C;Species: Sulfolobus solfataricus
C;Species: Sulfolobus solfataricus
C;Species: Sulfolobus solfataricus
C;Species: Sulfolobus solfataricus
C;Species: Sulfolobus solfataricus
C;Species: Sulfolobus solfataricus
R;Sensen, C.W.; Klenk, H.P.; Singh, R.K.; Allard, G.; Chan, C.C.Y.; Liu, Q.Y.; Penny, S.Mol. microbiol. 22, 175-191, 1996
A;Title: Organizational characteristics and information content of an archaeal genome: 1 A;Reference number: S73076; MUID:97055432
A;Reference number: S73076; MUID:97055432
A;Status: nucleic acid sequence not shown; translation not shown
A;Molecule type: DNA
A;Reference: EMBL:Y08256; NID:91707679; PIDN:CAA69503.1; PID:91707699
A;Experimental source: strain P2
A;Note: the nucleoited sequence was submitted to the EMBL Data Library, September 1996
C;Superfamily: trehalose trehalohydrolase
C;Keywords: 91ycosidase; hydrolase
                                                                                                                                                                                                                                                                                                                                           ŝ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ;;
          EENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFYKIL 481
                                                                             541
                                                                                             120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 298
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  178
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  238
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                358
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                360
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                418
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              478
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             480
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            482 IKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFPQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      MTFAYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   LDDASEIPDPASRYQPEGVHGPSQIIQESKEFNNETF - - LKKEDLIIYEIHVGTFTPEGT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                FEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 HKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  EYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                CGYNIDAOWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRTH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              EYGEENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             KILIKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Length 561;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      49; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     82.8%; Score 2467; DB 2;
79.7%; Pred. No. 8.6e-153;
ive 63; Mismatches 49;
                                                                                                                                         HIEEGKYEFDKGFALYKL 559
                                                                                                                                                         Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      447;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Query Match
Best Local 9
Matches 447
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Match
                                                                                                                                         542
           422
                                          421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                119
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               179
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               239
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             479
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                299
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             419
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           421
           ολ
                                      g
                                                                        ò
                                                                                                     Op
                                                                                                                                       ò
                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      οχ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               õ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           à
```

5

sp.

16;

63;

Length Indels

5;

46

```
A; Variety: strain 036
C; Date: 28-Oct-1996 #sequence_revision 13-Mar-1997 #text_change 20-Jun-2000
C; Date: 28-Oct-1996 #sequence_revision 13-Mar-1997 #text_change 20-Jun-2000
C; Accession: S65770
Biochim. Biophys. Acta 1289, 10-13, 1996
A; Title: Clonding and sequencing of trehalose biosynthesis genes from Arthrobacter: A; Reference number: S65769; MUID:96195835
A; Reference number: S65770
A; Status: preliminary
A; Nolecule type: DAA
A; Nolecule type: DAA
A; Residues: 1-598 <AMAR>
A; Residues: 1-598 <AMAR>
C; Superfamily: trehalose trehalohydrolase
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  1 MTFAYKIDGNEVI----FTLWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTI--
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     --TLNNVKVRDRYKYVLD-DASEIPDPASRYQPEGVHGPSQIIQESK-EFNNETFLKKE-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               35.6%; Score 1060.5; DB 2; 39.7%; Pred. No. 2.7e-61; iive 92; Mismatches 197;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Conservative
C;Species: Arthrobacter sp.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Query Match
Best Local Similarity
Matches 232; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     47
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       281
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     447
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     JC4697
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Dp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Dp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             δy
                                                                                                                                                                     A.Note: Anabaena sp. (strain PCC 7120) is a synonym of Nostoc sp. strain PCC 7120 C;Date: 14-Dec-2001 #sequence_revision 14-Dec-2001 #text_change 11-Jan-2002 C;CAccession: AH1827 R;Kanenko, T.; Nakamura, Y.; Wolk, C.P.; Kuritz, T.; Sasamoto, S.; Watanabe, A.; Iriguchi Nakazaki, N.; Shimpo, S.; Sugimoto, M.; Takazawa, M.; Yamada, M.; Yasuda, M.; Tabata, B. 205-213, 2001 A;Title: Complete Genomic Sequence of the Filamentous Nitrogen-fixing Cyanobacterium Ana A;Reference number: AB1807; MUID:21595285; PMID:11759840
                                                                                                                                                                                                                                                                                                                                                                                                                                                     A;Status: preliminary
A;Molecule type: DNA
A;Residues: 1-620 <KUR>
A;Cross-references: GB:BA000019; PIDN:BAB77692.1; PID:g17135146; GSPDB:GN00179
A;Experimental source: strain PCC 7120
C;Genetics:
A;Gene: allo1068
C;Superfamily: trehalose trehalohydrolase
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            10;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 DDASEIPDPASRYQPEGVHGPSQIIQESKEFNNETF--LKKEDLIIYEIHVGTFTPEGTF 119
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  120 EGVIRKLDYLKDLGITAIEIMPIAQFPGK------RDWGYDGVYLYAVQNSYGGPEG 170
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      SDLNDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVF 344
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               VYDGKYSNFRRKTHGEPVGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAAL 404
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               405 YLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE-----NGQD-TDPQDE 458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          STFNASKLSWKIDEE----IFSFYKILIKMRK------ELSIACDRRVNVVNGE 502
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |: : | ||:| | | ||:| | | ||:| || ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:| ||:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      4 AYKIDGNEVIFTLWAPYQKSVKLKVL--EKGLYEMERDEKGYFTITLNNVKVRDRYKYVL 61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           RKFILENVEYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYN-----RIVIAE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              171 FRKLVDEAHKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         47;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Length 620;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Indels
                                                                                                                 [imported] - Anabaena sp. (strain PCC 7120)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               DB 2;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Query Match 43.3%; Score 1288.5; DB 2; Best Local Similarity 44.0%; Pred. No. 4.2e-76; Matches 255; Conservative 100; Mismatches 178;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         NWLIIKGREYFSLYVFSKSSIE----VKYSGTLLLSSNNS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Gene: al10168 Superfamily: trehalose trehalohydrolase
                                                                                                                                              C; Species: Anabaena sp.
                                                                                                                    alpha-amylase
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               345
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      259
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 285
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         503
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         231
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 319
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              459
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  RESULT
S65770
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      οŽ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          οŽ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
```

```
C;Species: Rhizoblum sp.
C;Date: 10-May-1996 #sequence_revision 19-Jul-1996 #text_change 20-Jun-2000
C;Dates: 10-May-1996 #sequence_revision 19-Jul-1996 #text_change 20-Jun-2000
C;Accession: 104697
R;Maruta, K.; Hattori, K.; Nakada, T.; Kubota, M.; Sugimoto, T.; Kurimoto, M.
Biosci. Biotechnol. Biochem. 60, 717-720, 1996
A;Title: Cloning and sequencing of trehalose biosynthesis genes from Rhizoblum sp. M-A;Recession: JC4696; MUID: 96219094
A;Accession: JC4697
A;Molecule type: DNA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             408
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 446
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                102 -DLIIYEIHVGTFTPEGTFEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYA 160
                                     161 VQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTF 220
                                                                                                                                                                                                                                                            221 NFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRI 280
                                                                                                                                                                                                                                                                                                                                                                                          V-----IAESDLNDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLD 334
                                                                                                                                                                                                                                                                                                                                                                                                                                295 VGRPLTLIAESDLNNPRLLYPRDVNGYGLEGGWSDDFHHAVHVNVTGETTGYYSDFDSLA 354
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            335 DIVKSYKDVFVYDGKYSNFRKTHGEPVGELDGCNF-----VVYIQNHDQVGNRGKG 386
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                KE---NGQD----TDPQDESTFNASKLSWKIDEE----IFSFYKILIKMRKELSIAC--
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | :| || : : :|| || GFEDTQVAFDEDARWLRFRRGGVQVLLNFSEQPVSLDGAGTALL 572
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ---DRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               trehalose trehalohydrolase (EC 2.4.1.-) - Rhizobium sp.
```

maltooligosyltrehalose trehalohydrolase - Arthrobacter sp. (strain Q36)

Mon Jul

```
SSIEV 525
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       527 GPLRV 531
                                                                                                                                                                                                              Best Local Sim
Matches 215;
                                                                                                                                                                                 Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                   63
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      240
                                                                                                                                                                                                                                                                                                                                                                                  69
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        297
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       354
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        357
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          413
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         417
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        466
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           521
                                                                                                                                                                                                                                                                                                                                                                                  δy
                                                                                                                                                                                                                                                                                                                                                                                                                                 q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               q
                                                                                                                                                                                                                                                                                    δλ
                                                                                                                                                                                                                                                                                                                                엄
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       QΥ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ōλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              S.; Kurimot
A; Residues: 1-596 <MAR>
A; Residues: 1-596 <MAR>
A; Cross references: DDBJ:D78001; NID:g1040695; PIDN:BAA11187.1; PID:g1040697
C; Comment: This enzyme belongs to the alpha-amylase family. It hydrolyzes the products oligosyl group and trehalose.
C; Genetics:
A; Gene: MTHase
C; Superfamily: trehalose trehalohydrolase
C; Superfamily: trehalose trehalohydrolase
C; Keywords: glycosyltransferase; hexosyltransferase
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                malto-oligosyltrehalose trehalohydrolase (EC 3.2.1.141) - Arthrobacter ramosus C;Species: Arthrobacter ramosus C;Species: Arthrobacter ramosus C;Species: Arthrobacter ramosus C;Species: Arthrobacter ramosus C;Species: Arthrobacter ramosus C;Species: Dec-2001 #sequence_revision 14-Dec-2001 #text_change 31-Dec-2001 C;Accession: JC7272; PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC7175 PC
                                                                                                                                                                                                                                                                                                           16;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              242
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            || |: || || CHGRPI-----NFSAVHPAALVVCSQNHDQIGNRATGDRLSQSLPYGSLAYGSLAVLTLTG 428
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  488
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     297 EKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRK 356
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  THGEPVGELDGCNF-----VVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLS 408
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                PYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQDESTF 461
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 NASKLSWK----IDEEIFSFYKILIKMRK-----ELSIACDRRVNVVNGENWLIIKGR 510
                                                                                                                                                                                                                                                                                                                                                                                                                                                           EIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDL---IIYEIHVGTFTPEGTFEGV 122
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           123 IRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKG 182
                                                                                                                                                                                                                                                                                                           Gaps
                                                                                                                                                                                                                                                                                                                                                        14 FILWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTITLNNVKVRDRYKYVLD-DAS 65
                                                                                                                                                                                                                                                                                                                                                                                          KEYNVDGFRLDAVHAIIDTSPKHILEE---IADVVHKYN---RIVIAESDLNDPRVVNPK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             LGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWI
                                                                                                                                                                                                                                                                                                           62;
                                                                                                                                                                                                                                                          Length 596;
                                                                                                                                                                                                                                                                                                         Indels
                                                                                                                                                                                                                                                     34.4%; Score 1025; DB 2; 140.3%; Pred. No. 5.5e-59; ive 80; Mismatches 197;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 511 EYFS----LYVFSKSSIEVKYSGTLLL 533
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                543 RYWRGGVQVVLNFADRPISLDRPGTALL 570
                                                                                                                                                                                                                                                                               Local Similarion
                                                                                                                                                                                                                                                       Query Match
Best Local Si
Matches 2299
                                                                                                                                                                                                                                                                                                                                                                                                                                                           99
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           195
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            243
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              255
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              315
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                357
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                409
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               429
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 462
                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ö
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 õ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ద
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ç
```

```
A;Status: preliminary; nucleic acid sequence not shown; translation not shown A;Molecule type: DNA A;Residues: 1-580 <COL> A;Coss-references: GB:Z74020; GB:AL123456; NID:g3261584; PIDN:CAA98329.1; PID:g14034 A;Experimental source: strain H37Rv C;Genetics: A;Gene: 9192
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Species: Mycobacterium tuberculosis
C;Decies: Mycobacterium tuberculosis
C;Decies: Mycobacterium tuberculosis
C;Decession: G70763
R;Cole, S.T.; Brosch, R.; Parkhill, J.; Garnier, T.; Churcher, C.; Harris, D.; Gordon
R;Connor, R.; Davies, R.; Devlin, K.; Feltwell, T.; Gentles, S.; Hamlin, N.; Holroyd,
Rajandream, M.A.; Roquers, J.; Rutter, S.; Seeger, K.; Skelton, S.; Squares, S.
Nature 393, 537-544, 1998
A;Authors: Sqares, R.; Sulston, J.E.; Taylor, K.; Whitehead, S.; Barrell, B.G.
A;Title: Deciphering the biology of Mycobacterium tuberculosis from the complete geno
A;Reference number: A70500; MUID:98295987
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          probable maltooligosyltrehalose trehalohydrolase - Mycobacterium tuberculosis (strain
                                                                                                                                                                                                                                                                                    13;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ---LIIYEIHVGTFTPEGTF 119
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                DPRSLRQPRGVH-----ELGREFDPARYAWGDDGWRGRDLTGAVIYELHVGTFTPEGTL 116
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                EGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAH 179
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                YWIKEYNVDGFRLDAVHAIIDTSPKHILEEIA----DVVHKYNR--IVIAESDLNDPRVV 293
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    294 NPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNF 353
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    RRKTHGEPVG-ELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIP 412
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             MIFMGEEYGEENPFYFFSDFSDFSKLIQGVREGRKKE---NGQD----TDPQDESTFNASK 465
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   14 FILWAPYQKSVKLKVLEKGLYE--MERDEKGYFTITL---NNVKVRDRYKYVLDDASEIP 68
                                                                                                                                                                                                                                                                                                                                                                                       C:Comment: This enzyme is involved in producing trehalose from glycogen. C:Genetics:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  180 KKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           LSWKIDEE-----IFSFYKILIKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSK
                                                                                                                                                                                        5; DB 2; Length 575;
.6e-59;
                                                                                                                                                                                                                                                                                        Indels
                                                                                                                                                                                                                                                                                 189;
                                                                                                                                                                                                                        11 34.4%; Score 1024.5; 11 39.4%; Pred. No. 5.6e Conservative 90; Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       DPASRYQPEGVHGPSQIIQESKEFNNETFLKKED-
                                                                  A;Gene: treZ
C;Superfamily: trehalose trehalohydrolase
C;Keywords: glycosidase; hydrolase
                                                                                                                                                                                                                                                        Similarity
```

```
12;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                20;
                                                                                                                                                                                             250
                                                                                                                                                                                                                                366
                                                                                                                                                                                                                                                                                                            411
                                                                                                                                                                                                                                                                                                                        183
                                                                                                                                      KEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHK---YNRIVIAESDLNDPRVVNPKEKC 299
                                                                                                                                                                                                                                                                GYN--IDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDD--IVKSYKDVFVYDGKYSNFRR 355
                                                                                                                                                                                                                                                                                                                                                          PMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE----NGQDT-DPQDESTFNASKL 466
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SEIPDPASRYQPEGVHGPSQIIQESKEFNNETF------LKKEDLIIYEIHVGTFTP 115
                                                                            67 IPDPASRYQPEGVHGPSQIIQESKEFNNETFLKK---EDLIIYEIHVGTFTPEGTFEGVI 123
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Gaps
             Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    64
                                              GVILDVVYNHVGPEGNYMVKLGP-YFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWI
                                                                                                                                                                                    FRLWTSTARTVAVRVNGTEHVWTSLGGGIYELELP------VGPGARYLFVLDGV
                                 IDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVLDDASE
                                                                                                                          124 RKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGL
                                                                                                                                                                                                                                                                                                            KTHGEPVGELD----GCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       FTLWAPYQKSVKLKV------LEKGLYEMERDEKGYFTITLNNVKVRDRYKYVLDDA
           29;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Length 600;
           Indels
ed. No. 5.7e-56;
Mismatches 169;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DB 2;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               86; Mismatches 170;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         30.4%; Score 905.5; DB 2
38.7%; Pred. No. 3.2e-51;
 Pred. No.
         76;
 43.38;
al Similarity 43.3
209; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   al Similarity
205; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                      SWK 469
                                                                                                                                                                                                                                                                                                                                                                                                                           NWK 488
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Query Match
Best Local
Matches 20
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Best Loca
Matches
                                                                                                                                                 134
                                                                                                                                                                       184
                                                                                                                                                                                            194
                                                                                                                                                                                                                   243
                                                                                                                                                                                                                                                               300
                                                                                                                                                                                                                                                                                                            356
                                                                                                                                                                                                                                                                                                                                                                                                     467
                                                                                                                                                                                                                                                                                                                                                                                                                           486
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  65
                                                     g
                                                                                               g
                                                                                                                                                                                         셤
                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                              셤
                                                                                                                                                                                                                                                                                                                                                                                                     δy
                                                                                                                                                                                                                                                                                                                                                                                                                       셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                  ŏ
                                                                            δ
                                                                                                                          δ
                                                                                                                                              g
                                                                                                                                                                   δ
                                                                                                                                                                                                                  δ
                                                                                                                                                                                                                                                               δ
                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                       Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        11;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  A;Residues: 1-594 <PAR>
A;Cross-references: GB:AL513382; PIDN:CAD01762.1; PID:916502610; GSPDB:GN00176
                                                                                                                                                                                                                            LDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWIKEYN 246
                                                                                                                                                                                                                                                                           PV -- GELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGE 418
                                                                                                                                                                                                                                                                                                                                                                    : : | |||||| |:||| 361 ALDTSAIPATRILGYGURALGDRPSQYLTGGQLAIKAALTLGSPYTAMLFMGE 420
                                                                                                                                                                                                                                                                                                                                                                                                                    : ||:||:|| :| 481 GSGEHARLHREYRDLIALRHNEADLADPWLDHLMVDYDEOQRWVVMRRGQLMIACNLGAE 540
                                                                                                                          73 RYQPEGVHGPSQIIQESKEF---NNET---FLKKEDLIIYEİHVGTFTPEGTFEGVIRKL 126
                                                                                                                                     DYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVI 186
                                                                                                                                                                                   ||| ||| ||| : |:||: | | | ||||||| ||:| ||||:| : :| | : |||: |||:| || DYLVDLGIDFVELMPVNSFAGTRGWGYDGVLMYSVHEPYGGPDGLVRFIDACHARRLGVL 181
                                                                                                                                                                                                                                                               VDGFRLDAVHAIIDTSPKHILEEIADVVHKYN-----RIVIAESDLNDPRVVNPKEKCG 300
                                                                                                                                                                                                                                                                                                           YNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGE 360
                                                                                                                                                                                                                                                                                                                                                                                                     EYGEENPFYFFSDFSDSKLIQGVREGRKKENGQD-----TDPQDESTFNASKLSWK-- 469
                                                                                                                                                                                                                                                                                                                                                                                                                                                  ---IDEEIFSFYKILIKMRKELSIACD-----RRVNVVNGENWLIIKGREYFSLYVFSKS 521
                                                        Gaps
                                                                            14 FTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVL-DDASEIPDPAS 72
                                                                                         35;
                                                        Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   DB 2; Length
                               ; Score 997.5; DB 2;
; Pred. No. 3.2e-57;
91; Mismatches 215;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  32.9%; Score 978.5;
C; Superfamily: trehalose trehalohydrolase
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Superfamily: trehalose trehalohydrolase
                               33.5%;
38.3%;
                                                     Matches 212; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | || ||:|:
541 PTCVPVSGELVLA 553
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              SIEVKYSGTLLLS 534
                                            Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Molecule type:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    STY1503
                                 Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          :Genetics:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             522
                                                                                                                                                                                                                                       182
                                                                                                                                                                                                                                                               247
                                                                                                                                                                                                                                                                                                                                                       361
                                                                                                                                                                     127
                                                                                                                                                                                            122
                                                                                                                                                                                                                  187
                                                                                                                                                                                                                                                                                                                                                                                                     419
                                                                                                                                                                                                                                                                                                                                                                                                                          421
                                                                                                                                                                                                                                                                                                                                                                                                                                                 470
                                                                                                                                                                                                                                                                                                           301
                                                                                                g
                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                             셤
                                                                                                                                                                                                                                                                                                                                                                                                                       q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                            ò
                                                                                                                        ò
                                                                                                                                            g
                                                                                                                                                                    ð
                                                                                                                                                                                          g
                                                                                                                                                                                                                δά
                                                                                                                                                                                                                                  q
                                                                                                                                                                                                                                                           õ
                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                ö
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
```

```
probable 1,4-alpha-glucan branching enzyme (EC 2.4.1.18) [imported] - Sinorhizobium m C; Species: Sinorhizobium meliloti
C; Species: Sinorhizobium meliloti
C; Species: Sinorhizobium meliloti
C; Species: Sinorhizobium meliloti
C; Species: Sinorhizobium meliloti
C; Species: Sinorhizobium meliloti
C; Species: Sinorhizobium meliloti
C; Species: Sinorhizobium meliloti
C; Species: Special C; Malloti C; Species: Special C; Species: Special C; Species: Special C; Species: Special C; Species: Special C; Species: Special C; Species: Special C; Species: Special C; Species: Species: Special C; Species: Special C; Species: Special C; Species: Special C; Species: Special C; Species: Special C; Species: Special C; Species: Special C; Species: Special Species: Special Special Species: Special Species: Special Species: Special Species: Special Species: Special Species: Special Species: Special Special Species: Special Species: Special Species: Special Species: Special Species: Special Species: Special Species: Special Species: Special Species: Special Species: Special Special Species: Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special Special S
                                                                                                                                                                                                                                                                                                                                                                                                                        403
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      401
    DSAHGMGLMVFVDVIYNHFGPDGNYLAQYAAAFFRDDRQTPWGQAIDF---RRGEVREFF 236
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     STATEMENT STATEMENT STATEMENT SET STATEMENT SETTING STREAMENT STATEMENT STATEMENT SETTING STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEMENT STATEM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          67 IPDPASRYQPEGVHGPSQIIQESK-EFNNETFLKK--EDLIIYEIHVGTFTPEGTFEGVI 123
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          RKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGL 183
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         7 IDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVLDDASE 66
                                                                                                                                                                                                                                                                                              237 YENALMWLLDYRVDGLRFDAVHAIPDSA----FLVEMARRLRGAAGPERHVH-----LVLE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        LYLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKENGQD-------
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  LOLLAPMIPLLFMGEECAAREPFLYFTD-HQGELADAVREGRRKEFGEFGRFGEGATLAS
                                                                                                                                                                                                                                                   SDLNDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGN-LDDIVKSYKDV
                                                                                                                                                                                                                                                                                                                                                                                                                        FVYDGKYSNFRKTHGEPVGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  77;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         453 -TDPQDESTFNASK-----LSWKIDEEIFSFYKILIKMRKELSI---
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          <u>:</u>
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      204;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    29.4%; Score 876.5; DB 2
35.3%; Pred. No. 2.5e-49;
iive 99; Mismatches 204
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            A;Genome: plasmid
C;Superfamily: trehalose trehalohydrolase
C;Keywords: glycosyltransferase; hexosyltransferase
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      LENVEYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIA-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              491 --- ACDRRVNVVNGENWLI 506
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Matches 207; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     A; Gene: glgB2; SMb21447
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   A; Contents: annotation C; Genetics:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Query Match
Best Local 3
                                                                                                                                                                                                                                                                                                                                     289
    180
                                                                                  235
                                                                                                                                                                                                                                                                                                                                                                                                                        344
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        404
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           402
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          124
                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                  ŏ
                                                                                                                                                            qq
                                                                                                                                                                                                                                              QY
                                                                                                                                                                                                                                                                                                                                                                                                                   ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     οχ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Unional by grossyl hydrolase PA2164 [imported] - Pseudomonas aeruginosa (strain PAO1) (Species: Pseudomonas aeruginosa (Species: Pseudomonas aeruginosa (Species: Pseudomonas aeruginosa (Species: Pseudomonas aeruginosa (Species: Pseudomonas aeruginosa (Species: Pseudomonas aeruginosa (Species: Diote: 15-Sep-2000 #sequence_revision 15-Sep-2000 #text_change 31-Dec-2000 (Species: Species: Sp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 M.J.; Br
K.; Lim,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 pathd
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     GB:AE004091; NID:g9948178; PIDN:AAG05552.1; GSPDB:GN001
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      19;
292
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            351
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 352 NFRRKTH--GEPVGELDGCNFVVYIQNHDQVGNRGKGERIIKL--VDRESYKIAAALYLL 407
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 SPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE-----NGQDT-DPQDES 459
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            DEAHKKGLGVILDVVYNHVGPEGNYMVK-LGPYFSQKYKTPWGLTFNFDDAESDEVRKFI 234
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DDASEIPDPASRYQPEGVHGPSQIIQES-----KEFNNETFLKKEDLIIYEIHVGTFTP 115
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     116 EGTFEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLV 175
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    7 FGAQFQGNGRTCFGLWAPDAREVRVETADGRDWPLEGSDSGWFEATL-PCPPGTRYRYRI 65
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    3 FAYKIDGN-EVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVL 61
                                                                                                                                                                     235 LENVEYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKY--NRIVIAESDLNDPRV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          257 TGNARWWLRDYHFDGLRLDATPYMTDDSETHILTELAQEIHELGGTHLLLAEDHRNLPDL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           DEAHKKGLGVILDVVYNHVGPEGNYMVKLGP-YFSQKYKTPWGLTFNFDDAESDEVRKFI
                                                                                                                                                                                                                                                                                                                                          VNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDF-GNLDDIVKSYKDVFVYDGKYS
                                                                                                                     EGTFEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Length 583;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 460 TFNASKLSWKIDE----EIFSFYKILIKMRKELSIACDR-RVNVVNGEN 503
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 489 TFLNSKLNWAEREGGEHARTLRLYRDLLRLRREDPVLHNRQRENLTTGHD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           29.6%; Score 881.5; DB 2; 36.3%; Pred. No. 1.1e-49; ive 95; Mismatches 174;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          :Gene: PA2164
:Superfamily: trehalose trehalohydrolase
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Best Local Similarity 36.3
Matches 203; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           293
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                62
                                                                                                                                                                                               140
                                                                                                                                                                                                                                                                                 176
                                                                                                                                                                                                                                                                                                                                                                    200
                                                                                                                     116
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  176
                                  음
                                                                                                            õ
                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                    δ
                                                                                                                                                                                                                                                                                                                                                           qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                      δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    õ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           q
```

Ωp	137 ERLPHLAGAGITAIEIMPVAQFPGVRGWGYDGVLHYAPHNAYGKPDDLKALVDAAHSLGL 196	Qy 182 GLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYW 241
ΟŸ	184 GVILDVVYNHVGPEGNYMVKLGP-YFSQKYKTPMGLTFNFDDAESDEVRKFILENVEYWI 242	Db 190 GIMVLLDVVYNHFGPAGNTLQAXAPAFFKKHETPWGPAPDFNRAEVRSFFLQNAFYW 246
q	197 TVLLDVVYNHFGPEGNYLSRYASRFFNKDRPTPWGASIAFEEEAVRRYFIENALYWL 253	Qy 242 IKEYNVDGFRLDAVHAITDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPK 296
Οý		Db 247 LETYRFDGLRIDAADHLAGGDGEVDFLIEMAREVKRTIRNRHVHLVIEDARNAASPMTPM 306
ф	254 GHFRFDGLRLDATEQIRDTTKPHFLVALEHEVREAFAERQIHLVLEDAHRRRSLLQRDAS 313	QY 297 EKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFR 354
٥y		Db 307 ADGAILVDAQWNDDFHHVIHVATTNEEGGIYEDFASRPYENLRRSLATGFVYQGEPRPSR 366
е 6 6	314 GARMLFDAAWNDDLHNALHVVATGETKGHYRLFADEPWGKIRSALAEGFAVPAKEDNESP 373 355 PKWHGEDVGELJGCNEVIVTONHDOVGNEGKETTKINDESVKIRAAIVITCOVID A12	Qy 355 R-KTHGEPVGELDGCNFVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPM 413
3 2		301 NEWSOURFOUNDEFORM VIE DRINGENOUNDINGENOUNDEFERDE EL DESTEDENTE DE L'ENTERNANT FORMENT EN SERVICE DE L'ENTERNANT EN SER
3 6	DOSKANY FFYON VICTOR TO FELDING TOURDS OF THE DELICED SERVING FOLK TO THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN THE MORE THAN TH	OY 414 TEMOGESTGEBRETEFSDESDENLIQGERGGRAN-ENGODTDPQGESTEN 462 IIII:
. අ	:	463 ASKLSWKIDEBIFSPYKTLIKMRKEISIACDRRVNVVNGENW
ò		487 I.STIKWHHAPTERPOSRADMAAILAKBRCHTWDIJOSHERGIGTOGFOOFTAL
; 名		505 1.TEKREVEST VVESKSTEVKVSGTITI.SSNNSFBOHTEBGKVE-FPKGFALV 557
ογ	ELSIAC-DRRVNVVNGENWL-IIKGREYFSLYVFSKSSIEVKYSGTL 531	544 HFKAGRLEMRANL-SENMCELPAVKGEILHRNGSVGNTRYEGYAAQFAIY
qq	: : :: : : : : : :	
		RESULT 14 S19134
RESULT AG3194 alpha-	RESULT 13 AG1194 alpha-amylase Atu5284 [imported] - Agrobacterium tumefaciens (strain C58, Dupont) plasmi	probable alpha-glucanotransferase - Anabaena variabilis C;Species: Anabaena variabilis C;bate: 13-Jan-1995 #sequence_revision 13-Jan-1995 #text_change 17-Mar-2000
C; Date	C.Date: 11-Jan-2002 #sequence_revision 11-Jan-2002 #text_change 01-Feb-2002	C,Accession: Sigist R;Sato, N.
C; Access R; Wood, erage, (C;Accession: AG3194 R;Wood, D.W.; Setubal, J.C.; Kaul, R.; Monks, D.; Chen, L.; Wood, G.E.; Chen, Y.; Woo, I erage, G.; Gillet, W.; Grant, C.; Guenthner, D.; Kutyavin, T.; Levy, R.; Li, M.; McClell	Plant Mol. Biol. 18, 165-170, 1992 A;Title: Cloning of a low-temperature-induced gene lti2 from the cyanobacterium Anaba A;Reference number: S19133; MUID:92119230
; kari Scienc A;Auth	; Karp, F.; Komero, P.; Zhang, S. Science 294, 2317-2323, 2001 A:Authors: Yoo, H.; Tao, Y.; Biddle, P.; Jung, M.; Krespan, W.; Perry, M.; Gordon-Kamm,	A; Accession: S19134 A; Status: preliminary A; Molecule type: DNA
ster, A;Titl A;Refe	ne Natural Genetic Engineer Agrobacterium tumefacie 77: PMID:11743193	A;Residues: 1-552 <sat> A;Cross-references: EMBL:X59279; NID:g39252; PIDN:CAA41970.1; PID:g39253 C:Sunerfamily: neonallalanse: alaba-amvlase core homology</sat>
	Accession: AG3194 Status: preliminary	
A; Mole A; Resi A; Cros	Molecule type: DNA Molecule 1-595 - KURA> Cross-references: GB-AE008687: PIDN:AAL45973.1: PID:d17743726: GSPDR:GN00188	Query Match 17.6%; Score 524.5; DB 2; Length 552; Best Local Similarity 28.0%; Pred No. 1.76-26; Matches 148; Conservative 90; Mismatches 162; Indels 129; Gans 22.
	Experimental source: strain C58 (Dupont) Genetics:	FTI MAD DVOK SUKIKVI FREIVE MEDDEKKYFTTTI NNUKUDD PVKVUI DDA 65
	u5284 plasmid	TILEAPYNKGAALIASFSDWQEIPWKKGDDGYFRTTVELEDGTYQYKFRVQTKSWFF
	Transily. Crematose crematony atomase	Qy 66EIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDLLIYEI 108
Quer Best	Query Match 28.9%; Score 860.5; DB 2; Length 595; Best Local Similarity 34.7%; Pred. No. 2.7e-48:	GEKIVDTYVWQHDDKPLPADHEI
Matches	6; Conservative 89; Mismatches 246; Indels 53; Ga	109 HVGTFTPEGTFEGVIRKLDYLKDLGITAIEIMPIAOFPGKRDMGYDGVYLYAV
δλ	AYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVLDD : : : : :	
qa ò	12 AQRHQSGDTDFSIWAPASATVKL-WLNDAEFDMHTAGDGWHDIT-KPALPGDRYGFVLAD 69 64 ASEIDDPASBYOPEGVHGPSOIIOESKEFNNETFIKKFDLITYFIHVGTFTPRGTFRG 121	QY 162 QNSYGGPEGFRKLVDEAHKKGLGVILDVVXNHVGPEGNY-MVKLGPYESQKYKTPWG 217
: 음		218 LTFNFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAIDTSPKHILEE
οy	122 VIRKLDYLKDLGITALEIMPIAQFPCKRDWGYDGVYLYANQNSYGGFEGFRKLVDEAHKK 181	243
Dp	130 AAEKLEYLADVGITTIELMPLATFAGSRGWGYDGVLQFSPQRDYGTPDELKAFIDQAHGH 189	Qy 270 IADVVHKKNRIVIAESDLNDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGY 326

Oy 438 IQGVI Db 430 Search complete Job time: 135 s	guchi ta, 9 m Ana	i
303 TAGAKPEYNVAEHIPETTSITNLDGPMDGCWHDSFYHTIKAHICGDT 349 327 YTDFGNLDDIVKSYKDVFVYDGKYSNFRKTHGEPVGELDGCNFVYYIQNHDQV 380 350 -PDLENLKDVI	**RESGLT** 15 AH1915 Hypothetical protein all0875 [imported] - Anabaena sp. (strain PCC 7120) C:Species: Anabaena sp. C:Species: Anabaena sp. C:Species: Anabaena sp. S:Strain PCC 7120) is a synonym of Nostoc sp. strain PCC 7120. C:Date: 14-Dec-2001 #sequence_revision 14-Dec-2001 #text_change 11-Jan-2002 C:Accession: AH1915 R:Kaneko, T:: Nakamura, Y:: Wolk, C.P.; Kuritz, T.: Sasamoto, S.: Watanabe, A.: Iriguchi NaKazaki, N.: Shimpo, S.: Sugimoto, M.: Takazawa, M.: Yamada, M.: Yasuda, M.: Tabata, S. DNA Res. 8, 205-213 DNA Res. 8, 205-213 2001 A:Tutle: Complete Genomic Sequence of the Filamentous Nitrogen-fixing Cyanobacterium Ana A:Reference number: AB1807: MUID:21595285; PMID:11759840 A:Reciscule type: DNA A:Residues: 1-552 (KUR> A:Residues: 1-552 (KUR> A:Crossrimental source: strain PCC 7120 C:Genetianiatal source: strain PCC 7120 C:Genetianiaty: neopullulanase; alpha-amylase core homology	Query Match Query Match Query Match 17.6%; Score 524.5; DB 2; Length 552; Best Local Similarity 28.0%; Pred. No. 1.76-26; Matches 148; Conservative 90; Mismatches 162; Indels 129; Gaps 22; 14 FTLMAPYOKSYKLKVLEKGIVE-MERDEKGYFTITLNNVKVRDRYKYVLDDAS 65 15
90 00 00 00 00 00 00 00 00 00 00 00 00 0	RESUL AH191 hypot C:Spe A:Not C:Dat C:Dat C:Ac R:Kan Na Ka Na Tit A:Tit A:Res A:Sta A:Sta A:Sta A:Cro A:Ecs A:Cro A:Ecs A:Cro C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen C:Gen	Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathematical Mathe

486	462
438 IQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFYKILIKMRK 486	: :: :: : : 30KQQDQSKIDWTLLGNDLNRSLFDYHKGLIGLRK 462
438	430
δy	QQ

Search completed: July 15, 2002, 12:18:43 Job time: 135 sec

			115			
				, , , , , , , , , , , , , , , , , , ,		
				-		*
		o :	participal	* 13 5	and the specific of	 South State of the
			100°		8.	× .
A.						
						0 .
k to						
	,					v
						ર

-6

```
Gencore version 4.5

Copyright (c) 1993 - 2000 Compugen Ltd.

OM protein - protein search, using sw model

Run on: July 15, 2002, 12:18:08; Search time 19.24 Seconds

(without alignments)
1124.960 Million cell updates/sec
Perfect score: 2978
Sequence: 1 MTPAYKIDGNEVIFTLWAPY.......PQHIEDGKYEFDKGFALYKL 559
Scoring table: BLOSUM62
Gapop 10.0, Gapext 0.5
Searched: 105224 seqs, 38719550 residues

Total number of hits satisfying chosen parameters: 105224
Minimum DB seq length: 0
Maximum DB seq length: 0
Maximum Match 0%
Maximum Maximum Match 0%
Listing first 45 summaries

Database: SwissProt_40:*
```

Pred. No. is the number of results predicted by chance to have a score greater than or equal to the score of the result being printed, and is derived by analysis of the total score distribution.

SUMMARIES

Description	Q44316 arthrobacte	Q53238 rhizobium s	Q9ajn6 arthrobacte	Q10769 mycobacteri		P30537 bacillus ca	_	P30538 bacillus st	P45177 haemophilus	P52980 streptomyce	P52981 synechocyst		_			P52979 agrobacteri			P14899 dictyoglomu			_		_	P29964 thermoanaer	-	P30924 solanum tub	P15067 escherichia		006458 thermus agu	Q45101 bacillus co	Q08047 zea mays (m	Q01401 oryza sativ
SUMMARIES	TREZ_ARTSP	TREZ_RHISP	TREZ_ARTRM	TREZ_MYCTU	TREZ_BREHE	GLGB_BACCL	GLGB_BACSU	GLGB_BACST	GLGB_HAEIN	GLGB_STRAU	GLGB_SYNY3	GLGB_SYNP7	GLGB_MYCTU	GLGB_BUTFI	GLGX_HAEIN	GLGB_AGRTU	PULA_THEMA	TREC_BACSU	AMY3_DICTH	MAXS_YEAST	AMY_BACME	O16G_BACTR	O16G_BACCE	AMY2_DICTH	CDAS_THEET	GLGB_ECOLI	GLGB_SOLTU	GLGX_ECOLI	GLGB_HUMAN	TRES_THEAQ	O16G_BACCO	GLGB_MAIZE	GLGB_ORYSA
DB	-	П	Н	Н	7	٦	7	H	٦	7	٦	-	-	-	-	7	-	٦	7	7	7	Н		Н		Н	-	-		Н	Н		1
% Query Match Length	598	596	575	280	289	999	627	639	730	764	770	773	731	639	629	734	843	561	498	581	520	295	558	562	574	728	861	657	702	963	552	799	820
% Query Match	35.6	34.4	34.4	33.5	32.4	13.1	12.6	12.6	11.4	11.2	11.2	11.0	10.9	10.8	10.7	10.7	10.5	10.2		10.1	10.0	10.0	10.0	10.0	9.0	6.6	9.7	9.6	9.6	9.5	9.5	9.5	9.3
Score	1060.5	1025	1024.5	997.5	965	391	374.5	374.5	340	332	333.5	326.5	326	321	318	318	314	303	300 ×	300	299	298.5	298	298	294.5	294.5	288.5	287	285.5	283	282.5	282.5	278
Result No.	-	2	က	4	S	9	7	8	6	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	56	27	28	29	30	31	32	33

Q10427 schizosacch Q10767 mycobacteri P38940 bacillus st P3275 saccharomyc P32818 bacillus ac Q08751 thermoactin P21543 paenibacill P29093 bacillus sp P21567 saccharomyc G32611 flavobacter Q54796 streptococc G06994 bacillus su	S	AA.	te) date) (EC 3.2.1.141) (MTHase) (4- e trehalohydrolase)	TREE. Arthrobacter sp. (strain Q36). Bacteria; Firmicutes; Actinobacteria; Actinobacteridae; Actinomycetales; Micrococcineae; Micrococcaceae; Arthrobacter. NCBI_TaxID=1667;	M., Sugimoto T., Kurimoto M.; synthesis genes from	Arthrobacter sp. Q36."; Biochim. Biophys. Acta 1289:10-13(1996)!- CATALYTIC ACTIVITY: Hydrolysis of alpha-(1->4)-D-glucosidic linkage in 4-alpha-D-[(1->4)-alpha-D-glucanosyl]n trehalose to yield trehalose and alpha-(1->4)-D-glucan.	GLYCOSYL HYDROLASES, ALSO	This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/			SIMILARITY. 8BSC610AD3766947 CRC64;	5; DB 1; Length 598; e-62; es 197; Indels 63; Gaps 16;	MTFAYKIDGNEVIFTLWAPYQKSVKLKVLEKG-LYEMERDEKGYFTI 46 : : : : :: :: MTHTYPREAAKPVLGPARYDVWAPNAESVTLLAGGERYAMQRRAETGFEDAGWWTAAG 58	TLNNVKVRDRYKYVLD-DASEIPDPASRYQPEGVHGPSQIIQESK-EFNNETFLKKE- 101
YDDI_SCHPO GLGX_MYCTU NEPU_BACST GAGE_YEAST GAGE_YEAST AMY BACAD NEPU_THEVU NEPU_THEVU O16G_BACSP AMYI_SACFI ISOA_FLASP DEXB_STRPN	ALIGNMENT	PRT; 598	l) equence upda notation up lohydrolase no}trehalos alohydrolas	acteria; Ac ae; Microco	.217; .T., Kubota ehalose bio	0-13(1996). hysis of al >4)-alpha-D	PATHWAY: Trenalose blosynthesis. SIMILARITY: BELONGS TO FAMILY 13 OF KNOWN AS THE ALPHA-AMYLASE FAMILY.	right. It i of Bioinfor institute. ions as lon s not remov	sb-sib.ch).	lylase. se_N. 1.	1. BY SIMILARI 8B5C610AD	Score 1060.5; Pred. No. 4e-62; Mismatches	FTLWAPYQKSVKLKVLEKG-LYEMER- : : : ARYDVWAPINAESVTLLAGGERYAMQRR	PDPASRYQPEG
			eated st se st an treha gluca treh	Q36) tinob ccine	=8605 akada of tr	289:1 Hydro -{(1-	10SYN TO FA MYLAS	copy tute ics I titut	nseei	, ha_am amyla lase;	e_N; 1 MW;	68; Sc 78; PJ 92;	TLWAP	DASEI
478 721 588 704 586 1196 598 777 777 535		NDARD;	40, Cr 40, La 40, La alose pha-D- nalose	strain es; Ac icroco	PubMed K., N	36."; Acta 1 VITY: lpha-D and	LOSE D LONGS LPHA-A	rry is Insti format format t ins) lice	9668.1 1; Alp 3; iso na-amy	amylas dase. 267 6583	35. 39. 7ative	F : LGPARY	KYVLD-
$\begin{array}{c} \omega\omega\omega\omega\omega\omega\omega\omega\omega\omega\omega\omega\omega\omega\omega\omega\omega\omega\omega$		STA	(Rel. (Rel. (Rel. (Rel. (Rel. (Rel. (Rel. (Rel. (Rel. (Rel. (Rel. (Rel. (Rel. (Rel (Rel (Rel (Rel (Rel (Rel (Rel (Rel	sp. (strmicute	M N.A. 35835; I Tattori 1 sequer	sp. O. phys. Acriving Acriving 4-al	Trehal TY: BEI THE AI	SWiss Swiss Bioind Profit this	email to	3; BAA09 PRO0046 PRO04193 8; alph	12; isos 11ycosic 267 98 AA;	35.6%; ilarity 39.7%; Conservative 9	DGNEVI	'KVRDRY!
2 271.76 6 266.5 7 266.5 7 266.5 9 265.5 9 256.5 1 257.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256.5 256		JLT 1 LARTSP TREZ_ARTSP Q44316;	16-OCT-2001 (Rel. 40, Created) 16-OCT-2001 (Rel. 40, Last sequence update) 16-OCT-2001 (Rel. 40, Last annotation update) Malto-oligosyltrehalose trehalohydrolase (EC 3.; alpha-D-{(1->4)-alpha-D-glucano}trehalose treha. (Maltooligosyl trehalose trehalohydrolase).	TREZ. Arthrobacter Bacteria; Fi Actinomyceta NCBI_TaxID=1	[1] SEQUENCE FRC MEDLINE=9619 Maruta K., H "Cloning and	Arthrobacter Biochim. Bic -!- CATALYTI linkage yield tr	-!- PATHWAY: -!- SIMILARI KNOWN AS	This SWISS-P between the the European use by non uselified and entities reo	or send an e	EMBL, D6334: InterPro; IF InterPro; IF Pfam; PF0012	Pfam; PF02922; isoamylase_N; 1. Hydrolase; Glycosidase. ACT_SITE 267 267 BY SIM SEQUENCE 598 AA; 65831 MW; 8B5C	Query Match Best Local Similarity Matches 232; Conser	1 MTFAYKIDGNEVI : : 1 MTHTYPREAAKPV	47TLNNV
लेलेलेलेलेलेकेकेकेके				8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8				3888888			KW FT SQ	Oue: Bes: Mate	oy Db	Qy

Mon Jul

```
between the Swiss Institute of Bioinformatics and the PMBL outstation the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@lsb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation -
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           SEQUENCE FROM N.A. MEDILE-96219094; PubMed-8829547; MEDILE-96219094; PubMed-8829547; Maruta K., Hattori K., Nakada T., Kubota M., Sugimoto T., Kurimoto M.; "Cloning and sequencing of trehalose biosynthesis genes from Rhizobium
                                                                                                   -DLIIYEIHVGTFTPEGTFEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYA 160
                                                                                                                                                                                                                                              VQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTF 220
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              NFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRI 280
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      DIVKSYKDVFVYDGKYSNFRRKTHGEPVGELDGCNF------VVYIQNHDQVGNRGKG 386
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRK 446
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     447 KE---NGQD----TDPQDESTFNASKLSWKIDEE----IFSFYKILIKMRKELSIAC-- 492
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          469 KEFERMGWDPAVVPDPQDPETFRRSKLDWAEAAEGDHARLLELYRSLTALRRSTPDLTKL 528
                                                                                                                                                                     115 QGAVIYELHLGTFTPEGTLEAAAGKLDYLAGLGVDFIELLPVNAFNGTHNWGYDGVQWFA 174
                                                                                                                                                                                                                                                                                                                                                                                                                              V-----IAESDLNDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLD 334
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ţ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (4-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 SGI. Biotechnol. Biochem. 60:717-720(1996).

CATALYTIC ACTIVITY: Hydrolysis of alpha-(1->4)-D-glucosidic
linkage in 4-alpha-D-{(1->4)-alpha-D-glucanosyl}(n) trehalose
yield trehalose and alpha-(1->4)-D-glucan.
PATHWAY: Trehalose biosynthesis.
SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO
KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 16-OCT-2001 (Rel. 40, Created)
16-OCT-2001 (Rel. 40, Last sequence update)
16-OCT-2001 (Rel. 40, Last annotation update)
Malto-oligosyltrehalose trehalohydrolase (EC 3.2.1.141) (MTHase)
alpha-D-{(1->4)-alpha-D-glucano|trehalose trehalohydrolase)
(Maltooligosyl trehalose trehalohydrolase).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Rhizobium sp. (strain M-11).
Bacteria; Proteobacteria; alpha subdivision; Rhizobiaceae group;
Rhizobiaceae; Rhizobium.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    --- DRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLL 533
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      GFEDTOVAFDEDARWLRFRRGGVQVLLNFSEQPVSLDGAGTALL 572
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  596 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         NCBI_TaxID-391;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  TREZ_RHISP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Biosci.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              RHISP
                                                                                                                                                                                                                                                                                                                                                                                      221
                                                                                                                                                                                                                                                                                                                                                                                                                                                        235
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             281
                                                                                                                                                                                                                                          161
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     335
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             387
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    493
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  529
                             음
                                                                                                   ò
                                                                                                                                                                     තු
                                                                                                                                                                                                                                       δ
                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                  δ
                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                A PART A REPORT OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF COLOR OF CO
```

```
16;
                                                                                                                                                                                                                                243 KEYNVDGFRLDAVHAIIDTSPKHILEE---IADVVHKYN---RIVIAESDLNDPRVVNPK 296
                                                                                                                                                                                                                                                                                                                                                                                                                                     297 EKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRK 356
                                                                                                                                                                                                                                                                                                                                                                                                                                                   THGEPVGELDGCNF------VVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLS 408
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          461
                                                                                                                                                                                                                   EIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDL---IIYEIHVGTFTPEGTFEGV 122
                                                                                                                                     Gaps
                                                                                                                                                               14 FTLWAPYQKSVKLKVLEKG-LYEMER-----DEKGYFTITLNNVKVRDRYKYVLD-DAS 65
                                                                                                                                                                                       17 FDIWAPEAGTVTL -- LAGGERYEMGRRPGNGPADEGWWTAADAPTGADVDYGYLLDGDEI 74
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     (4-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   NASKLSWK-----IDEEIFSFYKILIKMRK-----ELSIACDRRVNVVNGENWLIIKGR
                                                                                                                                                                                                                                                                       IRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKG
                                                                                                                                                                                                                                                                                                                                                                                               LGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               PYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQDESTF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  3.2.1.141) (MTHase)
                                                                                                                                     62;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Arthrobacter ramosus.
Bacteria; Firmicutes; Actinobacteria; Actinobacteridae;
Actinomycetales; Micrococcineae; Micrococcaceae; Arthrobacter
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Watanabe H., Yamashita H., Kubota M.,
                                                                                                         Length 596;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        16-OCT-2001 (Rel. 40, Created)
16-OCT-2001 (Rel. 40, Last sequence update)
16-OCT-2001 (Rel. 40, Last annotation update)
Malto-oligosyltrehalose trehalohydrolase (EC 3.2.1.141) (MTI
alpha-D-{(1->4)-alpha-D-glucano}trehalose trehalohydrolase)
(Maltooligosyl trehalose trehalohydrolase).
                                                                   73EA80AE0534DDCD CRC64;
                                                                                                         34.4%; Score 1025; DB 1;
40.3%; Pred. No. 8.4e-60;
iive 80; Mismatches 197;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  575 AA
                                                     BY SIMILARITY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        EYFS-----LYVFSKSSIEVKYSGTLLL 533
InterPro: IPR000461; Alpha_amylase.
Pfam; PF00128; alpha-amylase; 1.
Hydrolase; Glycosidase.
ACT_SITE 265 265 BY SIMI
SEQUENCE 596 AA; 65767 MM.
                                                                                                                                     Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      × Σ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Yamamoto T., Maruta
Fukuda S., Kurimoto
                                                                                                                       Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              [1]
SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  NCBI_TaxID=1672;
                                                                                                                       Best Local Sim
Matches 229;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        STRAIN-S34;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 TREZ_ARTRM
                                                                                                           Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Q9AJN6;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  375
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     511
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    TREZ_ARTRM
                                                                                                                                                                                                                   99
                                                                                                                                                                                                                                                                                                                           183
                                                                                                                                                                                                                                                                                                                                                                                                          255
                                                                                                                                                                                                                                                                                                                                                                                                                                                              315
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        357
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               409
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        429
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   462
 DR
DR
FT
SO
                                                                                                                                                                                     g
                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                               QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ŏ
                                                                                                                                                                                                                   ŏ
                                                                                                                                                                                                                                                                                                                          οy
                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                              οy
                                                                                                                                                                                                                                                                                                                                                                                                       a
                                                                                                                                                                                                                                                                                                                                                                                                                                     ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                       à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     òγ
```

```
01-OCT-1996 (Rel. 34, Created)
01-OCT-1996 (Rel. 34, Last sequence update)
16-OCT-2001 (Rel. 40, Last annotation update)
Malto-oligosyltrehalose trehalohydrolase (EC 3.2.1.141) (WTHase) (4-
                                                                                                                                                                    Actinomycetales; Corynebacterineae; Mycobacteriaceae; Mycobacterium.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             STRAIN-CDC 1551 / Oshkosh,
Fleischmann R.D., Alland D., Eisen J.A., Carpenter L., White O.,
Fleischmann R.D., Alland D., Eisen J.A., Carpenter L., Hickey E.,
Kelonay J.F., Nelson W.C., Unayam L.A., Ermolaeva M.D., Salzberg S.,
Delcher A., Utterback T., Weidman J., Khouri H., Gill J., Mikula A.
                                                                                                                                                                                                                                             MEDLINE=98295987; PubMed=9634230;
MEDLINE=98295987; PubMed=9634230;
Gordon S.V., Elglmeler K., Gas S., Barry C.E. III, Tekala F.,
Badcock K., Basham D., Brown D., Chillingworth T., Connor R.,
Baylin K., Feltwell T., Gentles S., Hamlin N., Holroyd S.
Hornsby T., Jagels K., Kroph A., McLean J., Moule S., Murphy L.,
Oliver S., Osborne J., Quail M.A., Rajandream M.A., Rogers J.,
Rutter S., Seeger K., Skelton S., Squares S., Squares R.,
Sulston J.E., Taylor K., Whitehead S., Barrell B.G.;
"Deciphering the biology of Mycobacterium tuberculosis from the
                                                                                  alpha-D-{(1->4)-alpha-D-glucano}trehalose trehalohydrolase)
(Maltooligosyl trehalose trehalohydrolase).
TREZ OR RV1562C OR MT1613 OR MTCY48.03.
                                                                                                                                                    Bacteria; Firmicutes; Actinobacteria; Actinobacteridae;
                                                                                                                                   Mycobacterium tuberculosis.
                                                                                                                                                                                                                                                                                                                                                                                                                                    Nature 393:537-544(1998).
                                                                                                                                                                                                                SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SEQUENCE FROM N.A.
                                                                                                                                                                                   NCBI_TaxID-1773;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  FIGR; MT1613; -
                                                                                                                                                                                                                                   STRAIN=H37RV,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Bishai W.;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Query Match
     This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation-the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@ib-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                   13;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    354 RRKTHGEPVG-ELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIP 412
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    DPASRYQPECVHGPSQIIQESKEFNNETFLKKED-----LIIYEIHVGTFTPEGTF 119
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               EGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAH 179
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                180 KKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVE 239
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               240 YWIKEYNVDGFRLDAVHAIIDTSPKHILEEIA----DVVHKYNR--IVIAESDLNDPRVV 293
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              237 YWLRDMHADGLRLDAVHALRDARALHLLEELAARVDELAGELGRPLTLIAESDLNDPKLI 296
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               294 NPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNF 353
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               413 MIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQDESTFNASK 465
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                LSWKIDEE-----IFSFYKILIKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSK 520
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 14 FTLWAPYQKSVKLKVLEKGLYE--MERDEKGYFTITL---NNVKVRDRYKYVLDDASEIP 68
"Trehalose producing operon treYZ from Arthrobacter ramosus S34.", Submitted (APR-2001) to the EMBL/GenBank/DDBJ databases.
-!- CATALYTIC ACTIVITY: Hydrolysis of alpha-(1->4)-D-glucosidic linkage in 4-alpha-D-[(1->4)-alpha-D-glucanosyl](n) trehalose tyled trehalose and alpha-(1->4)-D-glucanosyl-(n) trehalose they are alpha-(1->4)-D-glucanosyl-(n) trehalose thosynthesis.
-!- PATHWAX: Trehalose blosynthesis.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     51;
                                                                                                                                                                                                                                                                                                                                                                                                                34.4%; Score 1024.5; DB 1; Length 575; 39.4%; Pred. No. 8.6e-60; Live 90; Mismatches 189; Indels 51;
                                                                                                                                                                                                                                                                                                                                                              284A3F20207E228B CRC64;
                                                                                                                                                                                                                                                                                                                                                BY SIMILARITY
                                                                                                                KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                InterPro; IPR000461; Alpha_amylase.
Pfam; PF00128; alpha-amylase; 1.
                                                                                                                                                                                                                                                                              EMBL; AB045141; BAB40766.1; -.
                                                                                                                                                                                                                                                                                                                                                                63079 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                               Best Local Similarity 39.49
Matches 215; Conservative
                                                                                                                                                                                                                                                                                                                               Hydrolase; Glycosidase.
                                                                                                                                                                                                                                                                                                                                                                575 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               521 SSIEV 525
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               531
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               527 GPLRV
                                                                                                                                                                                                                                                                                                                                               ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                 Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                69
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                466
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                63
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              357
 셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 å
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ö
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           οχ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Dp
```

S.L.,

٥,

Harris

: S

```
This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation-the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   11;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Gaps
                                                                                       CATALYTIC ACTIVITY: Hydrolysis of alpha-(1->4)-D-glucosidic linkage in 4-alpha-D-[(1->4)-alpha-D-glucanosyl](n) trehalose to yield trehalose and alpha-(1->4)-D-glucan.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   61
"Whole genome comparison of Mycobacterium tuberculosis clinical and laboratory strains.";
Submitted (APR-2001) to the EMBL/GenBank/DDBJ databases.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              14 FTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVL-DDASEIPDPAS
                                                                                                                                                                              -!- PATHWAY: Trehalose biosynthesis.
-!- SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   35;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Length 580;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SIMILARITY.
506190468F44B862 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        DB 1;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  33.5%; Score 997.5; DB 1
38.3%; Pred. No. 5.1e-58;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   91; Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Hydrolase; Glycosidase; Complete proteome.
ACT_SITE 247 247
SEQUENCE 580 AA; 64076 MW; 506190468F4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     or send an email to license@isb-sib.ch)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         EMBL; AE007027; AAK45880.1; ALT_INIT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Tuberculist; Rv1562c; -.
InterPro: IPR000461; Alpha_amylase.
InterPro: IPR004193; isoamylase_N.
Pfam; PF00128; alpha-amylase_N.
Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             EMBL; Z74020; CAA98329.1;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Local Simines 212;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Matches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
```

580 AA.

PRT;

STANDARD;

TREZ_MYCTU

TREZ_MYCTU

RESULT ΩI

Page

```
send an email to license@isb-sib.ch)
                                                                                                                 Best Local Sim
Matches 218;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           GLGB_BACCL
                                                                                                      Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          enzyme).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    P30537
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               GLGB_BACCL
                                                                                                                                                14
                                                                                                                                                                                                                                  121
                                                                                                                                                                                         68
                                                                                                                                                                                                                                                                                                                    241
                                                                                                                                                                                                                                                                                                                                         246
                                                                                                                                                                                                                                                                                                                                                             295
                                                                                                                                                                                                                                                                                                                                                                                 306
                                                                                                                                                                                                                                                                                                                                                                                                                           998
                                                                                                                                                                                                                                                                                                                                                                                                                                                413
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    426
 SO FE B DR CC
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                         ŏ
                                                                                                                                                                                                            q
                                                                                                                                                                                                                                ÓΥ
                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                          Ωy
                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                   òγ
                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                            δ
                                                                                                                                                                                                                                                                                                                                                                                В
                                                                                                                                                                                                                                                                                                                                                                                                      QY
                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                               Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          between the Swiss Institute of Bioinformatics and the EMBL outstation-the Buropean Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                This SWISS-PROT entry is copyright. It is produced through a collaboration
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          for
                                                                                                                                                         300
                                                                                                                                                                              360
                                                                                                      300
                                                 DYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVI 186
                                                             LDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWIKEYN 246
                                                                                                                                                                                         480
        RYQPEGVHGPSQIIQESKEF---NNET---FLKKEDLIIYEIHVGTFTPEGTFEGVIRKL 126
                   t
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               4-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Bacteria; Firmicutes; Actinobacteria; Actinobacteridae;
Actinomycetales; Micrococcineae; Brevibacteriaceae; Brevibacterium.
NCBL_TaxID=1704;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            361 PV--GELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGE
                                                                                                                                                                                                                                   247 VDGFRLDAVHAIIDTSPKHILEEIADVVHKYN-----RIVIAESDLNDPRVVNPKEKCG
                                                                                                                                                                              YNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGE
                                                                                                                                                                                                                                                                EYGEENPFYFFSDFSDSKLIQGVREGRKKENGQD-----TDPQDESTFNASKLSWK--
                                                                                                                                                                                                                                                                             |:| :|| || : :| || || : || EWGASSPFQFFCSHPEPELAHSTVAGRKEEFAEHGWAADDIPDPQDPQTFQRCKLNWAEA
                                                                                                                                                                                                                                                                                                         ---IDEEIFSFYKILIKMRKELSIACD-----RRVNVVNGENWLIIKGREYFSLYVFSKS
                                                                                                                                                                                                                                                                                                                             481 GSGEHARLHRFYRDLIALRHNEADLADPWLDHLMVDYDEQQRWVVMRRGQLMIACNLGAE
                                                                                                                                                                                                                                                                                                                                                                                                                                            16-OCT-2001 (Rel. 40, Created)
16-OCT-2001 (Rel. 40, Last sequence update)
16-OCT-2001 (Rel. 40, Last annotation update)
Malto-oligosyltrehalose trehalohydrolase (EC 3.2.1.141) (WTHase)
alpha-D-{(1->4)-alpha-D-glucano}trehalose trehalohydrolase)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                (Maltooligosyl trehalose trehalohydrolase)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                           PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                           STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Brevibacterium helvolum.
                                                                                                                                                                                                                                                                                                                                                                      541 PTCVPVSGELVLA 553
                                                                                                                                                                                                                                                                                                                                                  SIEVKYSGTLLLS 534
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     STRAIN-ATCC 11822;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                         TREZ_BREHE
O52520;
                                                                                                                                                                                                                                                                                                                                                                                                      RESULT 5
TREZ_BREHE
                            62
                                                                     122
                                                                                          187
                                                                                                                                                                             301
                                                                                                                                                                                                  301
                                                                                                                                                                                                                                                               419
                                                                                                                                                                                                                                                                                   421
                           g
                                                                  g
                                                                                                             g
                                                                                                                                                     a
                                                                                                                                                                                               g
                                                                                                                                                                                                                                         염
                                                                                                                                                                                                                                                                                 q
                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                          ò
                                                                                                                                 ò
                                                                                                                                                                            ò
                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                       õ
                                                                                                                                                                                                                                                                                                                                                 δ
```

```
13;
                                                                                                                                                                                                                                                                                                                                                                                                  GVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHK 180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           GRHHGRPINPSLANPAALVVCNQNHDQIGNRATGDRLSQSLSYGQLAVAAVLTLTSPFTP 425
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 465
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       545
                                                                                                                                                                                                                                                                                                                                                                     PDPASRYQPEGVHGPSQII-----QESKEFNNETFLKKEDLIIYEIHVGTFTPEGTFE 120
                                                                                                                                                                                                                                 Gaps
                                                                                                                                                                                                                                                                            FTLWAPYQKSVKLKVLEKGLYEMERDE-----KGYFTITLNNVKVRDRYKYVLD-DASEI 67
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            01-APR-1993 (Rel. 25, Created)
01-APR-1993 (Rel. 25, Last sequence update)
01-CT-1996 (Rel. 34, Last annotation update)
1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                         KGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    WIKEYNVDGFRLDAVHAIIDTSPKHILEE---IADVVHKYN---RIVIAESDLNDPRVVN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | | : | | : | | : | | : | | | IDMSEASTGDHARILELYKSLTAIRREHPDLADIGFGQTEVSFDDDAGWLRFRPVSVEVL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               PKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      355 RKTHGEPVGE--LDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 MIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE---NGQD----TDPQDESTFNASK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          466 LSWK-----IDEEIFSFYKILIKMRKELSIACD-----RRVNVVNGENWLIIKGREYFSL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            MLFMGEEYGASTPWQFFTSHPEPELGKATAEGRIKEFERMGWDPAVVPDPQDPETFNRSK
                                                                                                                                                                                                                               44;
                                                                                                                                                                                 Length 589;
                                                                                                                                                                                                                                 Indels
                                                                                        C282314B6E9BA029 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   .;
G
                                                                                                                                                                                                                                 Mismatches 216;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Bacteria; Firmicutes; Bacillus/Clostridium group; Bacillus/Staphylococcus group; Bacillus.
                                                                                                                                                                                   Score 965; DB 1;
Pred. No. 6.9e-56;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Kiel J.A.K.W., Boels J.M., Beldman G., Venema
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   666 AA
           InterPro; IPR000461; Alpha_amylase. Pfam; PF00128; alpha-amylase; 1. Hydrolase; Glycosidase. 258 BY SIM SEQUENCE 589 AA; 64217 MW: C287
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     516 YVFSKSSIEV-KYSGTLLLSSNNSFP 540
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                571
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             [1]
SEQUENCE FROM N.A.
MEDLINE=93208370; Pubmed=1296817;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               546 VNLSDAKVRLDDAAGDLLLATDEGNP
                                                                                                                                                                                                                                 88;
                                                                                                                                                                                   32.4%;
38.5%;
EMBL; AF039919; AAB95369.1;
                                                                                                                                                                                                                                 Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Bacillus caldolyticus.
Bacteria; Firmicutes;
                                                                                                                                                                                                         Similarity
```

S

```
셤
                                       ŏ
                                                                                                                                                                                               This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation-the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          31;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           NETFLKK------EDLIIYEIHVGTF--TPEGTF----EGVIRKLDYLKDLGITAIEI 139
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     GNYMVKLGP---YFSQKYKT--PWGLTFNFDDAESDEVRKFILENVEYWIKEYNVDGFRL 252
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             131 DSPWQRKKRRKRIYDQPMVIYELHFGSWKKKPDGRFYTYREMADELIPYVLERGFTHIEL 190
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               MPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHV--GPE 197
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         361 PVGELDGCNFVVYIQN-----HDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYI--- 411
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             --NOVSFSLLYAYSENFILPFSHDEVVH-GKKSLLNKMPGSYEEKF-AQLRLLYGYMMAH 454
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PGKKLLFMGSE-------AEELDW 480
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         469 KIDEEIFSFYKILIKMRKELSIACDRRVNVV-----NGENWLIIKGREYFSLYVFSKS 521
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          202; Indels 170; Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ---KVLEKGLYEMERD 39
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 EKGYFTITLNNVKVRDRYKY - - VLDDASEI - - PDPASRYQPEGVHGPSQIIQESK - - EFN 93
     Ø
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   :|::| || || SYELFGAHVIRGGGAVGTRFCVWAPHAREVRLVGSFNDWNGTNSPLTKV------N
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               DAVHAII-----DTSPKHILEEIADVVHKY--NRIVIAESDLNDPRVVNPKEKCG
 gene from the thermophile Bacillus caldolyticus encodes
                                                                                                                                          SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 DAVANMLYWPNNDRLYENPYAVEFLRQLNEAVFAYDPNVWMIAEDSTDWPRVTAPTYDGG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   301 YNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       369 LGFNYKW---------NMGWMNDMLK-YMETPPHERKYAH-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ---PMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSW
                                                                       glycogen.
PATHRAY: THIRD STEP IN GLYCOGEN BIOSYNTHESIS.
MISCELLANEOUS: OPTIMAL ACTIVITY AT APPROXIMATELY 39 DEGREES
                                                        σĘ
                                                   -!- CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ; DB 1; Length 666; 2.7e-18;
                                                                                                                                                                                                                                                                                                                                                                                                                                      Glycogen biosynthesis, Transferase, Glycosyltransferase.

ACT_SITE 309 309 BY SIMILARITY.

ACT_SITE 352 352 BY SIMILARITY.

ACT_SITE 420 420 BY SIMILARITY.

SEQUENCE 666 AA; 78096 WW, 1F64C31495BB1B6E CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                         BY SIMILARITY.

BY SIMILARITY.

BY SIMILARITY.

1 1F64C31495BB1B6E CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ; Pred. No. 2.7e-
99; Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              4 AYKIDGNEVI------FTLWAPYQKSVKL----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Score 391;
                                                                                                                                                                                                                                                                                                                                                                InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                                      Pfam; PF00128; alpha-amylase; 1.
Pfam; PF02922; isoamylase_N; 1.
                    enzyme.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      13.1%;
                                                                                                                                                                                                                                                                                                                                                EMBL; 214057; CAA78440.1;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Conservative
                                  ONA Seq. 3:221-232(1992)
               thermolabile branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Best Local Similarity
Matches 155; Conserv
                                                                                                                            CELSIUS
 glgB
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   40
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     72
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         94
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       198
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         251
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             253
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 309
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     155
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             399
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 412
ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               õ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
```

..

```
between the Swiss Institute of Bioinformatics and the EMBL outstation—
the European Bioinformatics Institute. There are no restrictions on its
use by non-profit institutions as long as its content is in no way
modified and this statement is not removed. Usage by and for commercial
entities requires a license agreement (See http://www.isb-sib.ch/announce/
or send an email to license@lsb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     This SWISS-PROT entry is copyright. It is produced through a collaboration
481 VLFD--FELHRKMDEYVKQL-1ACYKRYKPFYELDHDPRGFEWIDVHNAEQ-SIFSFIRR 536
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Lapidus A., Galleron N., Sorokin A., Ehrlich S.D.;
"Sequencing and functional annotation of the Bacillus subtilis genes
in the 200 kb rrnB-dnaB region.",
microbiology 143:3431-3441(1997).

-!- FUNCTION: CATALYSES THE FORMATION OF THE ALPHA-1,6-GLUCOSIDIC
LINKAGES IN GLYCOGEN BY SCISSION OF A 1,4-ALPHA-LINKED
OLIGOSACCHARIDE FROM GROWING ALPHA-1,4-GLUCAN CHAINS AND THE
SUBSEQUENT TRANSFER OF THE OLIGOSACCHARIDE TO OTHER PARTS OF
ALPHA-1,4-GLUCAN CHAINS.
                                                                                                                                                                                     01-FEB-1995 (Rel. 31, Created)
01-FEB-1995 (Rel. 31, Last sequence update)
16-CCT-2001 (Rel. 40, Last annotation update)
1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             PATHWÄY: THIRD STEP IN GLYCOGEN BIOSYNTHESIS.
INDUCTION: EXPRESSED EXCLUSIVELY ON MEDIA CONTAINING CARBON
SOURCES THAT ALLOW EFFICIENT SPORULATION
SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO
                                                                                                                                                                                                                                                                                                                                                                                                                                                       an
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 of
                                                                                                                                                                                                                                                                                                                                                                                                                                Kiel J.A.K.W., Boels J.M., Beldman G., Venema G.; "Glycogen in Bacillus subtilis: molecular characterization of operon encoding enzymes involved in glycogen biosynthesis and
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Glycogen biosynthesis; Transferase; Glycosyltransferase;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Y SIMILARITY.
Y SIMILARITY.
Y SIMILARITY.
64B0A5553B6767BA CRC64;
                                                                                                                                                                                                                                                                                                           Bacteria; Firmicutes; Bacillus/Clostridium group; Bacillus/Staphylococcus group; Bacillus.
NCBL_TaxID=1423;
                                                                                                                                                      627 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         PIR; S36624; S36624.
SubtiList; BG10907; g1gB.
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                                                 MEDLINE=94195107; PubMed=8145641;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        MEDLINE=98048467; Pubmed=9387221;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    1. Microbiol. 11:203-218(1994)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Pfam; PF00128; alpha-amylase; 1. Pfam; PF02922; isoamylase_N; 1.
                                                     G---KKEGDVLVIVCNFTNQAYDDYK
                                  SIEVKYSGTLLLSSNNSFPQHIEEGK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     BY
BY
BY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   309 BY
352 BY
420 BY
73665 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     EMBL; Z25795; CAA81040.1; -.
EMBL; AF008220; AAC00214.1; -
EMBL; Z99119; CAB15076.1; -.
                                                                                                                                                        STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 309
352
420
627 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                 SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                             Bacillus subtilis.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      proteome
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   glycogen.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  degradation
                                                                                                                                                    GLGB_BACSU
P39118;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ACT_SITE
ACT_SITE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                              enzyme).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Complete
                                                                                                                                    GLGB_BACSU
                                  522
                                                                  537
                                                                                                                    RESULT
```

```
24;
                                                                                                                                                                                                                                215
                                                                                                                                                                                                                                                                                         272
                                                                                                                                 332 FLKKLNQTMREAYPHVMMIAEDSTEWPQVTGAVEEGGLGFHYKW------ 375
                                                                                                                                                                                                                                                                                                                                                                                                                       MEDIINE-92079888; PubMed-1745226;
Kiel J.A.K.W., Boels J.M., Beldman G., Venema G.;
"Mochecular cloning and nucleoride sequence of the glycogen branching
enzyme gene (9198) from Bacillus stearothermophilus and expression in
Escherichia coli and Bacillus subtilis.";
                                                                                                                                                                         HVGTFTPEGTFEGVIRK-----LDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQ 162
                                                                                                                                                                                                                                                            273
                                                                                                                                                                                                                                                                                                                   331
                                                                                                                                                                                                                                                                                                                                              273 VVHKYNR-----IVIAESDLNDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGER 323
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     NPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQD------ESTFNASKLSW--- 468
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             527
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ASEI-------PDPAS-RYQPEGVHGPSQIIQESKEFNNETFLKKEDLIIYEI 108
                                                                                                                                                                                                                                                                                                                                                                                                                                                               ----NHDQVG------NRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYGEE 423
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ----FDEWKDTEQLDWFLDSFPMHQKASVFTQDLLRFYQKSKILYEHDHRAQSFEWIDV 523
                                Gaps
                                                                           FTLWAPYQKSVKLKVLEKGLYE------MER-DEKGYFTITLNNVKVRDRYKY-VLDD 63
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                01-APR-1993 (Rel. 25, Created)
01-APR-1993 (Rel. 25, Last sequence update)
01-FEB-1995 (Rel. 31, Last annotation update)
1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                      154 HLGSWKKHSDGRHYSYKELSQTLIPYIKKHGFTHIELLPVYEHPYDRSWGYQGTGYYSPT
                                                                                                                                                                                                                                                SRFGPPHDLMKFVDECHQQNIGVILDWVPGHFCKDAHGLYMFDGEPLYEYKEERDRENWL
                                                                                                                                                                                                                                                                                       WGLTFNFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAII----DTSPKHILEEIAD
                                                                                                                                                                                                                                163 NSYGGPEGFRKLVDEAHKKGLGVILDVVYNHV--GPEGNYMVKLGPYFSQKYKTP----
                                                                                                                                                                                                                                                                                                                                                                                                       QGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGEPVGELDGCNFVVYIQ-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            469 -KIDEEIFSFYKILIKMRKELSIACDRRVNVNGENWLIIKGREYFSLYVFSKSSIEVKY
                               Indels 147;
    Length 627;
Score 374.5; DB 1;
Pred. No. 3e-17;
1; Mismatches 223;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     group;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     639 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Bacillus stearothermophilus.
Bacteria, Firmicutes; Bacillus/Clostridium
Bacillus/Staphylococcus group; Geobacillus.
NCBL_FaxID=1422;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      PRT;
  12.6%; Scc
23.1%; Pre
live 94;
                               Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      STANDARD;
                Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   GLGB_BACST
P30538;
01-APR-1993 (
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SGT 530
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               GGS 582
  Ouery Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        enzyme).
                 Local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       RESULT 8
GLGB_BACST
                                                                                                                                                                         109
                                                                                                                                                                                                                                                                                       216
                             Matches
                                                                                                                 64
                                                                                                                                                                                                                                                                                                                                                                                                                                 376
                                                                                                                                                                                                                                                                                                                                                                                                                                                            376
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     424
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               580
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      a
                                                                                                                 ð
                                                                                                                                           g
                                                                                                                                                                      ò
                                                                                                                                                                                               g
                                                                                                                                                                                                                             δ
                                                                                                                                                                                                                                                   Q
                                                                                                                                                                                                                                                                              ŏ
                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                   q
                                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                            ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     õ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
```

```
This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               29;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               93 NNETFLKK------EDLIIYEIHVGTF--TPEGTF----EGVIRKLDYLKDLGITAIE 138
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       139 IMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHV--GP 196
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   LDAVHAII------DTSPKHILEEIADVVHKY--NRIVIAESDLNDPRVVNPKEKC 299
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               GLGFNYKW-----TYMETPPEHRKYVHN 399
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              EPVGELDGCNFVVYIQN-----HDQVGNRGKGERIIKLVDRESYKIAAAL---YLLS- 408
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             PYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSW 468
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    251
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     308 VDAVANMLYWPNSDVLYKNTYAVEFLOKLNETVFAYDPNILMIAEDSTDWPRVTAPTYDG 367
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                100 KVTFSL----LYAYSENFILPFSHDEVVH-GKKSLLSKMPGTYEEKFAQLRLLYGYLLTH 454
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         81
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         KIDEEIFSFYKILIKMRKELSIACDRRVNVV-----NGENWLIIKGREYFSLYVF 518
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                4 AYKIDGNEVI-----KULEKGLYEMBPYQKSVKL--------KVLEKGLYEMERD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    EGNYMVKLGPYF - - - - SQKYKTPWGLTFNFDDAESDEVRKFILENVEYWIKEYNVDGFR
                                                                                              ALSO
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            E--KGYFTITLNNVKVRDRYKYVL--DDASEI--PDPASRYQPEGVHGPSQIIQ-ESKEF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 GYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRKTHG
                of
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Indels 167;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Length 639;
Mol. Gen. Genet. 230:136-144(1991).
-!- CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages
                                                                                            SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                           PATHWAY: THIRD STEP IN GLYCOGEN BIOSYNTHESIS. MISCELLANEOUS: THE TEMPERATURE FOR OPTIMAL ACTIVITY APPROXIMATELY 55 DEGREES CELSIUS.
                                                                                                                                                                                                                                                                                                                                                                      Glycosyltransferase.
                                                                                                                                                                                                                                                                                                                                                                                                                   SIMILARITY.
F5BD4446B371E03A CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Score 374.5; DB 1;
Pred. No. 3e-17;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               190;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Mismatches
                                                                                                                                                                                                                                                                                                                                                             Glycogen biosynthesis; Transferase; Glycos ACT_SITE 309 309 BY SIMILARITY ACT_SITE 352 352 BY SIMILARITY
                                                                                                                                                                                                                                                                                                                                                                                                  BY SIMILARITY BY SIMILARITY
                                                                                                                                                                                                                                                                                   PIR; S18599; S18599.
InterPro: IPR000461; Alpha_amylase.
InterPro: IPR004193; isoamylase_N.
Pfam; PF00128; alpha-amylase_N.
Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               66;
                                                                                                                                                                                                                                                                                                                                                                                                                                   ..
M
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                12.6%;
                                                                                                                                                                                                                                                                      EMBL; M35089; AAA22482.1; -.
                                                                                                                                                                                                                                                                                                                                                                                                                    420
74795 1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                 420 4
639 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Query Match
Best Local Simi
Matches 141;
                                                                                                                                                                                                                                                                                                                                                                                                                    ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            40
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    197
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   252
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       061
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                368
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              360
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             †00
 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Db
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
```

```
This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation - the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          glycogen.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           GLGB_STRAU
P52980;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  enzyme).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                RESULT 10
GLGB_STRAU
106
                                                                                                                  216
                                                                                                                                                                           260
                                                                                                                                                                                                                                   309
                                                                                                                                                                                                                                                                                                                         518
                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                g
                         g
                                                        δλ
                                                                                  9
                                                                                                               δ
                                                                                                                                                                         δý
                                                                                                                                                                                                     qq
                                                                                                                                                                                                                                  δý
                                                                                                                                                                                                                                                             qq
                                                                                                                                                                                                                                                                                             ŏ
                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                   ŏ
                                                                                                                                                                                                                                                                                                                                                                                                             0,
                                                                                                                                                                                                                                                                                                                                                                                                                                        Dp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation - the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  30;
                                                                                                                                                                                                                                               STRAIN-RD (MAD / ATCC 51907;
MEDLINE-50350630; PubMed-7542800;
Fleischmann R.D., Adams M.D., White O., Clayton R.A., Kirkness E.F., Kerlavage A.R., Bult C.J., Tomb J.-F., Dougherty B.A., Merrick J.M., McRenney K., Sutton G., Fitzhugh W., Fields C.A., Gocayne J.D., Scott J.D., Shirley R., Lui L. I., Glodek A., Kelley J.D., Weidman J.F., Phillips C.A., Spriggs T., Hedblom E., Cotton M.D., Utterback T.R., Hanna M.C., Nguyen D.T., Saudek D.M., Brandon R.C., Gnehm C.L., McDonald L.A., Small K.V., Fraser C.M., Smith H.O., Venter J.C.;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         LDD-------ASE1-PDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDLII 105
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    192 LIDCHGNLRLKADPFAFSSQLRPDTAS--QVSALPNVVEMTEARKKANQ----GNQPISI 245
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              11.4%; Score 340; DB 1; Length 730;
ilarity 24.1%; Pred. No. 6.5e-15;
Conservative 101; Mismatches 214; Indels 158; Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             DG-NEVIFTLWAPYQKSVKLKVLEKGLYEMER-----DEKGYFTITLNNVKVRDRYKYV 60
                                                                                01-NOV-1995 (Rel. 32, Created)
01-NOV-1995 (Rel. 32, Last sequence update)
16-OCT-2001 (Rel. 40, Last annotation update)
1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              -!- SUBUNIT: MONOMER (BY SIMILARITY).
-!- SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                        of
                                                                                                                                                                      Haemophilus influenzae.
Bacteria; Proteobacteria; gamma subdivision; Pasteurellaceae;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages
                                                                                                                                                                                                                                                                                                                                                                                                                             'Whole-genome random sequencing and assembly of Haemophilus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Glycogen biosynthesis; Transferase; Glycosyltransferase;
Complete proteome.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ( SIMILARITY.
( SIMILARITY.
( SIMILARITY.
5B9575317F53769A CRC64;

    !- PATHWAY: THIRD STEP IN GLYCOGEN BIOSYNTHESIS.

                                                        730 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      InterPro; IPR000461; Alpha_amylase.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   InterPro; IPR004193; isoamylase_N. Pfam; PF00128; alpha-amylase_1. Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               BY
BY
BY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        83820 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           EMBL; U32815; AAC23004.1; -. 
TIGR; H11357; -.
                                                                                                                                                                                                                                                                                                                                                                                                                                          influenzae Rd.";
Science 269:496-512(1995)
                                                        STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               405
458
526
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       730 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Ouery Match
Best Local Similarity
Matches 150; Conserv
                                                                                                                                                                                                                    NCBI_TaxID=727;
                                                                                                                                                           GLGB OR HI1357
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       glycogen
                                                                                                                                                                                                      Haemophilus
                                                        GLGB_HAEIN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ACT_SITE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ACT_SITE
                                                                      P45177
                                       GLGB_HAEIN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        133
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         61
                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
```

```
365
                                                                                                                                                                                                                                                                                                   422
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               365
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    YEIHVGTF--TPEGTF----EGVIRKLDYLKDLGITAIEIMPIAOFPGKRDWGYDGVYL 158
                                                                                                                                                                                                                                                                                                                                                                                                                    423 IPNQYGGRENLEAIEFLKHTNWKIHSEMAGAISIAEESTSFAGVTHPSENGGLGFNFKWN 482
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          01-OCT-1996 (Rel. 34, Created)
01-OCT-1996 (Rel. 34, Last sequence update)
01-OCT-1996 (Rel. 34, Last annotation update)
1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Homerova D., Kormanec J.; "Cloning of the putative glycogen branching enzyme gene, glgB, from
                                                                                                                                                      ---DISPKHILEEIADVVH------KYNRIVIAESDINDPRVVNPKEKCGYNIDAQWV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Streptomyces aureofaciens.
Bacteria, Pirmicutes; Actinobacteria; Actinomycetales; Streptomyces.
Actinomycetales; Streptomycineae; Streptomyces.
NCBI_TaxID=1894;
                                                                                                                159 YAVQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTP---
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               DDFHHSIHAYLTGERQGYYTDFGNLDDIVKSY - - - KDVFVYDGKYSNFRRKTHGEPVGEL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           483 MGWMNDTLAYM------KLDPIYRQYHHNKMTFGMVYQYSE------
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       DGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIA--AALYLLS---PYIPMIFMGEEY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       121 GEENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSW-KIDEEI-FSFY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              KILIKMRKELSIACDRR-----VNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    -:- PATHWAY: THIRD STEP IN GLYCOGEN BIOSYNTHESIS.
-:- SUBUNIT: MONOMER (BY SIMILARITY).
-:- SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           of
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Streptomyces aureofaciens.";
Biochim. Biophys. Acta 1200:334-336(1994).
-!- CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages
                                                                                                                                                                                                                                       ----WG-LTFNFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAII-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 764 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             SEQUENCE FROM N.A.
STRAIN=CCM 3239 / ATCC 10762;
MEDLINE=94347823; Pubmed=8068720;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      533 LSSNNSFPQHIEE-----GKYE 549
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           VSNFTPVPRHNYRIGVNVAGKYE 678
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    STANDARD;
```

```
ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             EI-PDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDLI-----IYEIHVGTFTPE 116
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           GTFEGVIRKLD-YLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLV 175
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       DEAHKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTP-----WGLTFNFDDAESD 228
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  DALHRAGIGVIVDWVPAHFPRDDWALAEFDGRPLYEHODPRRAAHPDWG-TLEFDYGRK- 415
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 EVRKFILENVEYWIKEYNVDGFRLDAVHAII-------DTSPK-------HILE 268
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         EI-ADVVHKYNRIV-IAESDLNDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGE---R 323
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   536 KYHHHDMTFG----MVXARSE-------558 KYHHHDMTFG----MVXLPI-SHDEVV 564
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     382 NRGKGERIIKL-----VDRESYKIAAALYLLSPYIPMIFMGEEY--GEE-----NPFYFF 429
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               565 H-GKRSLVSKMPGDWWQQRATHRAYLGFMWAHPGKQLLFMGQEFAQGSEWSETYGPDWWV 623
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          178 FTVWAPNALGVRVTGDFSYWDAVAYPMRSLGASGVWELFLPGVAEGALYKYEITRPDGGR 237
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    298 LSYRQLAEQLPAYVKELGFTHVELMPVAEHPFGGSWGYQVTGFYAPTSRMGTPDDFRFLV 357
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            QGYYTD--FGNLDDIVKSYKDVFVYDGKYSNFRKTHGEPVGELDGCNFVVYIQNHDQVG 381
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        01-ocT-1996 (Rel. 34, Created)
01-ocT-1996 (Rel. 34, Last sequence update)
16-ocT-2001 (Rel. 40, Last annotation update)
1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                14 FTLWAPYQKSVKL----KVLEKGLYEMER-DEKGYFTITLNNVKVRDRYKYVL---DDAS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            624 LDSSYPAAGDH---LGVRSLVRDLN------RTYTASPALWERDSVPEGFAWVEADA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             430 SDFS-----DSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWK--------
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   11.2%; Score 335; DB 1; Length 764; 24.2%; Pred. No. 1.5e-14; Live 90; Mismatches 197; Indels 130;
                                                                                                                                                                                                                                                                                                                                        Glycosyltransferase
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Synechocystis sp. (strain PCC 6803).
Bacteria; Cyanobacteria; Chroococcales; Synechocystis.
                                                                               InterPro; IPR000461; Alpha_amylase.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram_pos_anchor.
INTERPRO; IPR001899; Gram.
INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INTERPRO; INT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         770 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         PRT;
                                            EMBL; L11647; AAA67437.1;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Best_Local Similarity 24.2 Matches 133; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Query Match
Best Local Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                470 IDEEIFSFYK 479
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         672 ADDNVFAFLR 681
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           enzyme).
GLGB OR SLL0158.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              NCBI_TaxID=1148;
[1]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               GLGB_SYNY3
P52981;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          416
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              476
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          RESULT 11
GLGB_SYNY3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             99
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            229
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           117
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        176
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         569
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            324
CC REAL REAL PROPERTY OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         임
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ద
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   õ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Q
```

```
This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             20;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            136 VDGVKGVYFAVWAPNARNVSILGDFNNWDGRLHQMRKRNNMVWELFIPELGVGTSYKYEI 195
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                62 DD----ASEIPDDPASRYQPEGVHGPSQIIQ-ESKEFNNETFLK------KEDLIIYEI 108
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ----FEGVIRKLDYLKDLGITAIEIM 140
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      PIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHVGPEGN- 199
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        PMVSWPTYVGGLGFNLKW-----DYFSMDPW 526
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      FRQFHQNSITFSMMYNHSE------NYMLAL-SHDEVVH-GKSNMLGKMPGDEWQKYA 576
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        -----YMVKLGPYFSQKYKTPWG-LTFNFDDAESDEVRKFILENVEYWIKEYNVDGFR 251
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            432 VDAVASMLYLDYCREEGEWVANEYGGRENLEAADFLRQVNSVYSYFPGILSIAEESTSW 491
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 YSNFRRKT------HGEPVGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIA 401
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             7 IDG-NEVIFTLWAPYQKSVKL----KVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVL 61
                                                  Sugiura M., Tabata S.;
Sequence analysis of the genome of the unicellular cyanobacterium "Sequence analysis of the genome of the unicellular cyanobacterium "Sequence analysis of the genome in the 1 Mb region from map positions 64% to 92% of the genome.";
DNA Res. 2:153-166(1995).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            LDAVHAII--------DTSPKHILEEIADVVHKY--NRIVIAESDLND
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              PRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGK
SEQUENCE FROM N.A.
MEDLINE-96127529; PubMed-8590279;
Kaneko T., Tanaka A., Sato S., Kotani H., Sazuka T., Miyajima N.,
                                                                                                                                                      ğ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Indels 129;
                                                                                                                       DNA Res. 2:153-166(1995).
-!- CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Length 770;
                                                                                                                                                                                                                                                                                                                                                                                                                                                 Pfam, PF00128; alpha-amylase; 1.
Pfam; PF02922; isoamylase_N; 2.
Glycogen biosynthesis; Transferase; Glycosyltransferase;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       BY SIMILARITY.

BY SIMILARITY.

BY SIMILARITY.

A435AFCA7703FA8A CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Score 333.5; DB 1;
Pred. No. 1.9e-14;
; Mismatches 176;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   402 AALYLLS-----PYIPMIFMGEEYGEENPFYFFSD 431
                                                                                                                                                                                                                                                                                                                                                                                                                 InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  11.2%; Scor.
23.1%; Pred
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    --TFTPEGT---
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         554 B
89527 MW;
                                                                                                                                                                                                                                                                                                                                                                                                  EMBL; D63999; BAA10073.1; -.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         554 5
770 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Complete proteome.
ACT_SITE 433 4
ACT_SITE 486 4
ACT_SITE 554 5
SEQUENCE 770 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  109 HVG-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Query Match
Best Local Simi
Matches 119;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        141
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        200
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                492
   염
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Óγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ά
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 δ
```

Φ

```
This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation the European Bioinformatics Institute. There are no restrictions on its
                                                                                                                                      ||| :: :| :| :| :| 439 DAVASMLYLDYNRKEGEWIPNEYGGRENI--EAADFLRQVNHLIFSYFPGALSIAEESTS 496
                                                                                                                                                                                                                                                                                        326 HPFDGSWGYQVTGYYAATSRYGSPEDFMYFVDRCHQNGIGVILDWVPGHFPKDGHGLA-- 383
                                                                           384 --FFDGTHLYEHADSRQGEHREWGTLVFNYG---RHEVRNFLAANALFWFDKYHIDGIRV 438
                                                                                                                                                                                                                                                                  349 KYSNFRRKTHGEPVGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLS 408
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Bacteria; Firmicutes; Actinobacteria; Actinobacteridae;
Actinomycetales; Corynebacterineae; Mycobacteriaceae; Mycobacterium.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   "Whole genome comparison of Mycobacterium tuberculosis clinical and
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          MEDLINE=9829597; PubMed=9634230;
Cole S.T., Brosch R., Parkhill J., Garnier T., Churcher C., Harris Cole S.T., Brosch R., Parkhill J., Gas S., Bary C.E. III. Tekala F., Badcock K., Basham D., Brown D., Chillingworth T., Connor R., Davies R., Devlin K., Feltwell T., Gentles S., Hamlin N., Holroyd & Hornsby T., Jagels K., Krogh A., McLean J., Moule S., Murphy L., Oliver S., Osborne J., Quail M.A., Rajandram M.A., Rogers J., Rutter S., Seeger K., Skelton S., Squares S., Squares R., Sulston J.E., Taylor K., Whitehead S., Barrell B.G.; Deciphering the biology of Mycobacterium tuberculosis from the Complete genome sequence.";
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 01-OCT-1996 (Rel. 34, Created)
1-OCT-1996 (Rel. 34, Last sequence update)
16-OCT-2001 (Rel. 40, Last annotation update).
Probable 1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen
                                       -QKYKTPWG-LTFNFDDAESDEVRKFILENVEYWIKEYNVDGFRL
                                                                                                                253 DAVHAI--IDTSPK-----IAESDLN
                                                                                                                                                                                       289 DPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDG
                                                                                                                                                                                                                 497 WPMVSWPTYVGGLGFNLKW-----DYFSMDP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              PATHWAY: THIRD STEP IN GLYCOGEN BIOSYNTHESIS.
SUBUNIT: MONOMER (BY SIMILARITY).
SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                STRAIN-CDC 1551 / Oshkosh;
Fleischmann R.D., Alland D., Eisen J.A., Carpenter L., White O.,
Fleischmann R.D., Hickey E.,
Beterson J., DeBoy R., Dodson R., Gwinn M.L., Haft D., Hickey E.,
Kolonay J.F., Nelson W.C., Umayam L.A., Ermolaeva M.D., Salzberg S.
Delcher A., Utterback T., Weidman J., Khouri H., Gill J., Mikula
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        to the EMBL/GenBank/DDBJ databases
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Ä.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             731
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              OR MT1368 OR MTCY130.11C.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               PRT;
                                                                                                                                                                                                                                                                                                                                             409 -----PYIPMIFMGEEYGE 422
                                                                                                                                                                                                                                                                                                                                                                   590 YMFTHPGKKTLFMGMEFGQ 608
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Mycobacterium tuberculosis.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             STANDARD;
                                 205 GPYFS-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Submitted (APR-2001)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       laboratory strains.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              branching enzyme)
GLGB OR RV1326C O
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         NCBI_TaxID=1773;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               01-OCT-1996 (
01-OCT-1996 (
16-OCT-2001 (
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             GLGB_MYCTU
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Bishai W.;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 010625
                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                  pp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ద
                                     ò
                                                                       g
                                                                                                              δ
                                                                                                                                              qq
                                                                                                                                                                                       Qγ
                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            20;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     207 IYEKSDPYG-FQQEVRPKTASIVADLDRYTWGDADWLERRRHQEPLRQPISVYEVHLGSW 265
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         266 MHASSDAIATDAQGKPLPPVPVADLKPGARFLTYRELADRLIPYVLDLGYSHIELLPIAE 325
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          --EIPDPASRYQPEGVHGPSQIIQESKEF--NNETFLK------KEDLIIYEIHVGTF 113
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     -----TPEGTF----EGVIRKLDYLKDLGITAIEIMPIAQ 144
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              145 FPCKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHVGPEGNYMVKL 204
                                                                                                                                            01-AUG-1990 (Rel. 15, Created)
01-AUG-1990 (Rel. 15, Last sequence update)
01-FEB-1995 (Rel. 31, Last annotation update)
1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               12 VIFTLWAPYQKSVKL----KVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVLDDAS--
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             -!- MISCELLANBOUS: THE TEMPERATURE FOR OPTIMAL ACTIVITY IS APPROXIMATELY 35 DEGREES CELSIUS.
-!- SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                         MEDLINE-90323609; PubMed-2142668;
Kiel J.A.K.W., Boels J.M., Beldman G., Venema G.;
"Nucleotide sequence of the Synechococcus sp. PCC7942 branching
enzyme gene (919B): expression in Bacillus subtilis.";
Gene 89:77-84(1990).
                                                                                                                                                                                                                                                                                                                                                                                                                                                          ō
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Indels 125;
                                                                                                                                                                                                                                                                                                                                                                                                                                                        CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Length 773;
                                                                                                                                                                                                                                                                Synechococcus sp. (strain PCC 7942) (Anacystis nidulans R2).
Bacteria; Cyanobacteria; Chrococcales; Synechococcus.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Glycogen biosynthesis; Transferase; Glycosyltransferase.
INIT_MET 0 0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ( SIMILARITY.

SIMILARITY.

SIMILARITY.

52BAA17CA337BF57 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                11.0%; Score 326.5; DB 1; 24.2%; Pred. No. 5.3e-14; tive 78; Mismatches 175;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             PATHWAY: THIRD STEP IN GLYCOGEN BIOSYNTHESIS SUBUNIT: MONOMER.
| : | : : : : | NVRALETYMFTHPGKKTMFMSMEFGQWSEWNVWGD 611
                                                                                                            773 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   PIR; JQ0550; JQ0550.
InterPro; IPR000461; Alpha_amylase.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     InterPro; IPR004193; isoamylase_N. Pfam; PF00128; alpha-amylase; 1. Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        BY
BY
BY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             89063 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  EMBL; M31544; AAB39038.1; -.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Best Local Similarity 24.2%
Matches 121; Conservative
                                                                                                              STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   492
560
773 AA;
                                                                                                                                                                                                                                                                                                                                           FROM N.A.
                                                                                                                                                                                                                                                                                      Bacteria; Cyanoba
NCBI_TaxID=1140;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             glycogen.
                                                                                                          GLGB_SYNP7
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ACT_SITE
ACT_SITE
ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                                                                                                       SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Query Match
                                                                                                                                                                                                                               enzyme).
                                                                                        GLGB_SYNP7
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        99
                                                                                                            셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
```

٥.,

s,

S.L.,

of

```
use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (see http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                      18;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          TFTPEGTFEGVIRKL-DYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEG 170
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              211
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    489
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         417
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      -VRDRYKKYVLDDASEIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDLIIYEIHVG 111
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      207 VVTDRADPFAFGTEVPPQTASRVTSSDYTWGDDDWMAGRALRNPV---NEAMSTYEVHLG 263
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ------DISPKHILEEIADVVHKY--NRIVIAESDLNDPRVVNPKEKCGYNIDAQWVD 309
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    12 VIPTLWAPYQKSVKL-------KVL-EKGLYEMERDE---KGYFTITLNNVK- 52
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            01-APR-1993 (Rel. 25, Created)
01-APR-1993 (Rel. 25, Last sequence update)
01-FEB-1995 (Rel. 31, Last annotation update)
1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            SWRPGLSYRQLARELIDYIVDQGFTHVELLPVAEHPFAGSWGYQVTSYYAPISRFGTPDD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  147 VSFAVWAPNAKGVSLIGEFNGWNGHEAPMRVLGPSGVWELFWPDFPCDGLYKFRVHGADG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   PNVHGGRENLEAVOFLQEMNATAHKVAPGIVTIAEESTPWSGVTRPTNIGGLGFSMKWNM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ------VLPLSHDEVVH-GKGTLWGRMPGNNHVKAAGLRSLLAYQWAHPGKQLLFWG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            FRKLVDEAHKKGLGVILDVV-------YNHVGPEGNYMVKLGPYFSQK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           324 FRALVDALHQAGIGVIVDWVPAHFPKDAWALGRFDGTPLYEHSDPKRGEQLDWGTY----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               -----VFDFG---RPEVRNFLVANALYWLQEFHIDGLRVDAVASMLYLDYSRPEGGWT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       363 GELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLS-----PYIPMIFMG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   310 DFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKD-----VFVYDGKYSNFRRKTHGEPV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       GWMHDT------LDYVSRDPVYRSYHHHEMTFSMLYAFSENY------
                                                                                                                                                                                                                                                                                                                                                                                                Score 326; DB 1; Length 731;
Pred. No. 5.4e-14;
; Mismatches 186; Indels 134;
                                                                                                                                                                                                                        Glycogen biosynthesis; Transferase; Glycosyltransferase; Complete proteome.

ACT_SITE 464 464 BY SIMILARITY.

ACT_SITE 532 532 BY SIMILARITY.

CONFLICT 214 P -> A (IN REF. 2).

CONFLICT 223 223 P -> Q (IN REF. 2).
                                                                                                                                                                                                                                                            BY SIMILARITY.
BY SIMILARITY
BY SIMILARITY.
P -> A (IN REF. 2).
P -> Q (IN REF. 2).
i. EE2BFEF765352617 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               YKTPWGLTFNFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAII---
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               639 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         EEYGEENPFYFFSDFSDSKLIQGVREGRKKENG 450
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Tuberculist; Rv1326c; -...
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                       10.9%; Scor.
22.8%; Pred
                                                                                                                                                                                        Pfam; PF00128; alpha-amylase; 1.
Pfam; PF02922; isoamylase_N; 1.
                                                                                                    AE007010; AAK45632.1; -.
                                                                                                                                                                                                                                                                                                                                                  ¥.
                                                                                    EMBL; Z73902; CAA98090.1;
                                                                                                                                                                                                                                                                                                                                                81729
                                                                                                                                                                                                                                                                                                                                                                                                                                    Matches 117; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                    Similarity
                                                                                                                                                                                                                                                                                                                                              731 AA;
                                                                                                                  MT1368;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            GLGB_BUTFI
P30539;
                                                                                                                                                                                                                                                                                                                                                                                                  Query Match
                                                                                                                                                                                                                                                                                                                                                SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                      Local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 enzyme)
                                                                                                     EMBL;
TIGR;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      53
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          112
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          264
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               380
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 92
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 430
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         418
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         576
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             GLGB_BUTFI
 d
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             원
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
```

```
This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         27;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         || || || ::::|| || || :: || DPRKGEHPDWGTKIFNL---AKPEVKNFLIANALYWIRKFHIDGLRVDAVASMLYLDYGK 325
                                                                                                                                                            Rumbak E., Rawlings D.E., Lindsey G.G., Woods D.R.;
"Characterization of the Butyrivibrio fibrisolvens glgB gene, which encodes a glycogen-branching enzyme with starch-clearing activity.";
J. Bacteriol. 173:6732-6741(1991).
-!- FUNCTION: TRANSFERS CHAINS OF 5 TO 10 (OPTIMUM, 7) GLUCOSE UNITS, USING AMYLOSE AND AMYLOPECTIN AS SUBSTRATES, TO PRODUCE A HIGHLY BRANCHED POLYMER.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       I--PDPASRY---QPEGVHGPSQII----QESKEFNNETFLKKED-----LIIYEIHVGT 112
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   FT--PEGTFEGVI------RKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQN 163
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    KDGQWVPNKYGDNKNLDAIEFFKH-FNSVVRGTYPNILTIAEESTAWPKVTAPPEEDGLG 384
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       IDAQWVDDFHHSIHAYLTGE---RQG--YYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKT 357
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              14 FTLWAPYQKSVKL----KVLEKGLYEMERDEKG-YFTITLNNVKVRDRYKYVL--DDASE 66
                                                                                                                                                                                                                                                                                                                        glycogen.
SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO
KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           WMKHPDGTEDGFYTYRQFADRIVEYLKEMKYTHIELIGIAEHPFDGSWGYQVTGYYAPTA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              K------HILEEIADVVHKYNRIV-----IAESDLNDPRVVNPKEKCGYN
 Butyrivibrio fibrisolvens.
Bacteria; Firmicutes; Bacillus/Clostridium group; Clostridiaceae;
Butyrivibrio.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            SYGGPEGFRKLVDEAHKKGLGVILDVVYNHVGP-----EGNYMVKLGPYFSQKYKTP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     -----WGL-TFNFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAI--IDTSP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         385 FAFKWIMGWMHDFCEYMKLDPYFRQGAHYMMTF-----AMSYN------
                                                                                                                                                                                                                                                                                                    -!- CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages of
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   10.8%; Score 321; DB 1; Length 639; 25.1%; Pred. No. 9.5e-14;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Glycogen biosynthesis; Transferase, Glycosyltransferase. ACT_SITE 313 13 BY SIMILARITY. ACT_SITE 366 BY SIMILARITY. ACT_SITE 366 BY SIMILARITY. ACT_SITE 367 36 BY SIMILARITY. SEQUENCE 639 AA; 73875 WW, DC93B72A5F28C2AF CRC64:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    BY SIMILARITY.

BY SIMILARITY.

BY SIMILARITY.

DC93B72A5F28C2AF CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           153;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Mismatches
                                                                                                          SEQUENCE FROM N.A., AND SEQUENCE OF 1-12
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       InterPro; IPR000461; Alpha_amylase.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             IPR004193; isoamylase_N.
                                                                                                                                              MEDLINE-92041554; PubMed-1938880;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Pfam; PF00128; alpha-amylase; 1. Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       81;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    EMBL; M64980; AAA23007.1; -.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PIR; B41328; B41328
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Similarity
                                                                         NCBI_TaxID=831;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Local Sim
nes 124;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             interPro;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Best Loca
Matches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  42
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       29
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           102
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 113
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      159
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          164
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               219
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         269
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     216
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              264
ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       엄
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
```

```
Job time: 384 sec
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        452
                                                                                                                                                                                                                                                                      QQ
                                                                                                                                                                                                                                                                                                                                                                          q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                          Db
                                                                                                            QΥ
                                                                                                                                                    q
                                                                                                                                                                                                          Qy
                                                                                                                                                                                                                                                                                                                 δy
                                                                                                                                                                                                                                                                                                                                                                                                                                         οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        δý
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation-the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             34;
                               MEDLINE—95350630; PubMed=7542800;
RICALINE—95350630; PubMed=7542800;
Relistenman R.D., Adams M.D., White O., Clayton R.A., Kirkness E.F.,
Rerlavage A.R., Bult C.J., Tomb J.-F., Dougherty B.A., Merrick J.M.,
McKenney K., Sutton G., Fitzhugh W., Fields C.A., Gocayne J.D.,
Scott J.D., Shirley R., Liu L.T., Glodek A., Kelley J.M.,
Weidman J.F., Phillips C.A., Spriggs T., Hedblom E., Cotton M.D.,
Pine L.D., Fritchman J.L., Ruhrmann J.L., Geoglagen N.S.M.,
Venter J.C.,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  98; Mismatches 173; Indels 186; Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             3 FAYKIDG-----NEVIFTLWAPYQKSVKLKVLEKGLYEMERDE-KGYFTITLNNVKVRDR 56
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  -!- FUNCTION: THIS PROTEIN MAY BE PART OF A GLYCOGEN BIOSYNTHETIC/
CATABOLIC OPERON BUT IS NOT REQUIRED FOR GLYCOGEN SYNTHESIS
  HGEPVGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPM----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  -!- SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Glycogen biosynthesis; Hydrolase; Glycosidase; Complete proteome.
ACT_SITE 333 333 RY STATIABIAN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Haemophilus influenzae.
Bacteria; Proteobacteria; gamma subdivision; Pasteurellaceae;
Haemophilus.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Whole-genome random sequencing and assembly of Haemophilus Influenzae Rd.";
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Length 659;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           BY SIMILARITY.
BY SIMILARITY.
E2B71F610E8B1CAC CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 10.7%; Score 318; DB 1; 23.1%; Pred. No. 1.6e-13;
                                                                                                                                                                                                                                                                                                                                                      01-NoV-1995 (Rel. 32, Created)
01-NoV-1995 (Rel. 32, Last sequence update)
10-CCT-2001 (Rel. 40, Last annotation update)
Glycogen operon protein glgX (EC 3.2.1.).
                                                                                                                                                                                                                                                                                                     659 AA.
                                                                                                                                                                                                                                                                                                     PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Pfam; PF00128; alpha-amylase; 1. Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    75290 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               EMBL; U32815; AAC23005.1; -.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Science 269:496-512(1995).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Matches 137; Conservative
                                                                                                                                                                                                                                                                                                     STANDARD;
                                                                                                                                        :|||:::|:|
470 GKKLLFMGQDFGQE 483
                                                                                                            ----IFMGEEYGEE 423
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 659 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Local Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           (BY SIMILARITY)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            NCBI_TaxID=727;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     GLGX OR HI1358
                                                                                                                                                                                                                                                                                                   GLGX_HAEIN
P45178;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Query Match
358
                                                      423
                                                                                                            414
                                                                                                                                                                                                                                               RESULT
                                                                                                                                                                                                                                                                                                     11D
DPT-1D
                                                  셤
                                                                                                         ŏ
                                                                                                                                                    Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ŏ
```

```
: | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | : | | : | : | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | 
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           161 QLNEKIPAALRGTYTGLAHPVNLAYLKELGVTAVELLPVNFHINEPHLQARGLQNYWGYN 220
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        209
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   57 YKYVLDDASEIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKK--EDLIIYEIHVGTFT 114
                                                                                                                                                                                                                                                                                                                                                                                                                                            115 P-----AQFPGKRD-WGYD 154
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                QK-----YKTPWGLTFNFD-----DAESDEVRKFILENVEYWIKEYNVDGFRLDAV 255
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    339 SYKDVFVYDGKYSNFRRKTHGEPVGELDGCNFVVYIQNHDQVGNRGKGERIIK----LV 393
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        394 DRESYKIAAAL--YLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKENGQ 451
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            221 PLAMFAVEPKYAATNNPLAEFKTMVKAFHKAGIEVILDVVFNHSAESEQTY-----PTFS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        155 GYYLYAVQNSYGGPEG----FRKLVDEAHKKGLGVILDVVYNH-VGPEGNYMVKLGPYFS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                256 HAIIDTSPKHILEEIADVVHKYNRIVIAESDL-NDPRVVNPK-----EKCGYNID--
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            305 ----AQWVDDFHHSI---HAYLTGERQGYYTDFGNLDDIVK-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             384 PSYFAEWNDRFRDDLCRFWLWKSGEIGAFAERFAGSSDLFKKNDRLPHTTLNFITAHDGF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                494 NNRTFAQSGLLMSLLLANGTPMLLAGDEFG-------NTQYGNNNAYCQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       DTDPQDESTFNASKLSW-KIDEEIFSFYKILIKMRKELSIACDRRVNVVNGENW 504
```

Search completed: July 15, 2002, 12:24:32 Job time: 384 sec .rsp

×

066936 aquifex aeo 004196 arabidopsis 084046 chlamydia t 005152 sulfolobus 05243 bacillus st 0928f5 chlamydia m 09pkz6 chlamydia m p73608 synechocyst

Q9f930 streptococc

Q9ky06 streptomyce P95813 streptomyce P9586 sulfolobus Q98594 rhizobium 1 Q22637 zea mays (m Q9m055 arabidopsis Q97343 sulfolobus Q97405 bacillus ha Q97705 bacillus ha Q97705 bacillus sp P70993 bacillus sp P70993 bacillus sp Q91872 bacillus sp Q91872 bacillus sp Q91872 bacillus sp Q91872 zea mays (m Q95173 zea mays (m

0905p3 neurospora 080403 oryza sativ 034587 bacillus su

Perfect score:

Sequence:

OM protein

Run on:

Scoring table:

Searched:

Database

```
Katon, Kettoku M., Miura Y., Komeda T., Konishi Y., Shindo K., Kobayashi K., Iwamatsu A.;

Kobayashi K., Iwamatsu A.;

The gene analysis of the new amylases from the hyper thermophilic archae Sulfolobus.";

Submitted (SEP-1995) to the EMBL/GenBank/DDBJ databases.

EMBL; D64130; BAA11010.1;

InterPro; IPR000461; Alpha_amylase.

InterPro; IPR004193; isoamylase."

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF002128; isoamylase.N:

Pfam; PF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Archaea; Crenarchaeota; Sulfolobales; Sulfolobaceae; Sulfolobus NCBL_TaxID-2287;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Length 559;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Last sequence update)
Last annotation update)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    100.0%; Score 2978; DB 1; 100.0%; Pred. No. 1.3e-180;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              .;
0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             0; Mismatches
                                                                                                                                                                                                                                                                                                                                                                                 ALIGNMENTS
                                                                                                                                                                                                                                                                                                                                                                                                                                            559
                                                                                                                      Q59832
P95868
Q985P4
Q92637
Q970S5
Q973H3
Q9K7U5
Q9K7U5
                      004196
084046
005152
                                                          Q59243
Q928F5
Q9PKZ6
P73608
Q9KY06
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Created)
                                                                                                                                                                                                                                                         Q9L872
Q9KTJ1
                                                                                                                                                                                                                                                                                                        099xx8
                                                                                                                                                                                                                                                                                                                                080403
                                                                                                                                                                                                                                                                                            041742
                                                                                                                                                                                                                                                                                                                                                                                                                                             PRT;
                                                                                                                                                                                                                                                                                 P71095
 10
10
10
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    01,
03,
19,
                                                                                                                                                                                                                                                                                                                                                                                                                                         Q55088 PRELIMINARY;
Q55088;
Q1-NOV-1996 (TYEMBLTEL. 0:
01-NAY-1997 (TYEMBLTEL. 0:
01-DEC-2001 (TYEMBLTEL. 15)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Best Local Similarity 100.
Matches 559; Conservative
 ALPHA-AMYLASE.
Sulfolobus solfataricus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  SEQUENCE FROM N.A.
STRAIN-KM1;
                        Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                    RESULT
Q55088
 994wn9 sulfoldous
995867 sulfoldous
993841 sulfoldous
99384 sulfoldous
99734 sulfoldous
99751 deinococcus
99715 sulfoldous
99715 sulfoldous
99745 anabaena va
695942 bacillus st
99343 pacillus sp
99343 bacillus sp
959319 caldocellum
959319 caldocellum
                                                                             July 15, 2002, 12:17:38 ; Search time 55.94 Seconds (without alignments) 1728.712 Million cell updates/sec
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     255088 sulfolobus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Pred. No. is the number of results predicted by chance to have a score greater than or equal to the score of the result being printed, and is derived by analysis of the total score distribution.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Description
                                                                                                                                                        ......PQHIEEGKYEFDKGFALYKL
                                                                                                                                                                                                                                             562222
            GenCore version 4.5
Copyright (c) 1993 - 2000 Compugen Ltd.
                                                                                                                                                                                                                                         Total number of hits satisfying chosen parameters:
                                                                                                                                                                                                                    562222 seqs, 172994929 residues
                                                                                                                                                                                                                                                                                                      Post-processing: Minimum Match 0%
Maximum Match 100%
Listing first 45 summaries

    protein search, using sw model

                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                090WN9
P95867
053641
0973H4
09ADI5
091X51
091X51
0973H5
069342
069342
069343
069343
069343
069343
069343
                                                                                                                                                                                BLOSUM62
Gapop 10.0 , Gapext 0.5
                                                                                                                                                        1 MTFAYKIDGNEVIFTLWAPY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     055088
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             sp_unclassified:*
                                                                                                                                                                                                                                                                                                                                                                                                       sp_human:*
sp_invertebrate:*
sp_mammal:*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                sp_phage:*
sp_plant:*
sp_rodent:*
sp_virus:*
sp_virus:*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     sp_bacteriap:*
sp_archeap:*
                                                                                                                                                                                                                                                                                                                                                                   sp_archea:*
sp_bacteria:*
sp_fungi:*
                                                                                                                                                                                                                                                                                                                                                                                                                                                      sp_organelle:*
                                                                                                                                                                                                                                                                   Minimum DB seq length: 0
Maximum DB seq length: 200000000
                                                                                                                                 US-09-298-924-6
2978
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          sp_rvirus:*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              DB
                                                                                                                                                                                                                                                                                                                                                         SPTREMBL_19:*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Query
Match Length
                                                                                                                                                                                                                                                                                                                                                                                                                                         sp_mhc:*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             561
359
359
581
600
583
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   100.0
95.3
82.8
58.7
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    42.6
34.7
30.4
229.6
229.7
117.6
113.3
113.3
                                                                                                                                                                                                                                                                                                                                                                                                                              66...
111...
114...
115...
```

; 0

Gaps

.; 0

Indels

61

qq δ

2467 1748.5 1033.5 905.5 905.5 881.5 881.5 876.5 706 524.5 399 395.5 381.5 365.5

Score

Result No.

δ q

1 MTFAYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYV us-09-298-924-6.rspt

2

```
121
                                                                                                                        361
                                                                                                                                       421
                                                                                                                                                                     481
                                                                                                                                                       121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Н
                                                                                                                                                                                                                                       RESULT
                                                                                                                                                                                                                                               P95867
                                                                                                                                                                                   QQ
   g
                  ò
                               q
                                               ō
                                                            qq
                                                                             ò
                                                                                          g
                                                                                                         δ
                                                                                                                       q
                                                                                                                                       Qγ
                                                                                                                                                     g
                                                                                                                                                                    ò
                                                                                                                                                                                                   ò
                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                      á
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ö
240
                                              240
                                                              300
                                                                           300
                                                                                          360
                                                                                                         360
                                                                                                                        420
                                                                                                                                       420
                                                                                                                                                      480
                                                                                                                                                            540
                                                                                                                                                                                                  540
                                                                                                                                                                                                                                                                                                                                                       Welting Y., Wei C., Hui W., Li L., Cheng J.;
Waltooligosyl trehalose trehalohydrolase from Sulfolobus shibatae.";
Submitted (NOV-1999) to the ENBL/GenBank/DDBJ databases.
EMBL, AF201335, AAF1553.1, ...
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           GVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHK 180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Gaps
                                      YNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRKTHGE
                                                                                                                      PVGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEY
                                                                                                                              GEENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFYKI
                                                                                                                                                                                          KGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEY
                                                           WIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEKCG
                                                                                                                                                                                 LIKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Sulfolobus shibatae.
Archaea; Crenarchaeota; Sulfolobales; Sulfolobus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ;
0
                                                                                                                                                                                                                                                                                                                                                                                                                                                   Length 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Indels
                                                                                                                                                                                                                                                                                                                                                                                                                             8C0F0F38A5AE2846 CRC64;
                                                                                                                                                                                                                                                                                (TrEMBLrel. 13, Created)
(TrEMBLrel. 13, Last sequence update)
(TrEMBLrel. 19, Last annotation update)
(L TREHALOSE TREHALOHYDROLASE.
                                                                                                                                                                                                                                                                                                                                                                                                                                                  tch 95.3%; Score 2837; DB 1; al Similarity 95.2%; Pred. No. 1.1e-171; 532; Conservative 11; Mismatches 16;
                                                                                                                                                                                                                                                                   559 AA
                                                                                                                                                                                                                                                                   PRT;
                                                                                                                                                                                                                                                                                                                                                                                                      PF00128; alpha-amylase; 1. PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                             64619 MW;
                                                                                                                                                                                                               QHIEEGKYEFDKGFALYKL 559
                                                                                                                                                                                                                      01-MAY-2000 (TrEMBLrel. 1:
01-MAY-2000 (TrEMBLrel. 1:
01-DEC-2001 (TrEMBLrel. 1:
MALTGOLIGOSYL TREHALOSE TI
                                                                                                                                                                                                                                                                   PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                             AA;
                                                                                                                                                                                                                                                                                                                                                   SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                    NCBI_TaxID-2286;
                                                                                                                                                                                                                                                                                                                                                                                                                             559
                                                                                                                                                                                                                                                                                                                                                                                                                      Hydrolase
                                                                                                                                                                                                                                                                                                                                                                                                                            SÉQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                   Query Match
Best Local
                                                                                                                                                                                                                                                                         09UWN9;
                                                                                                                                                                                                                                                                  6NMD60
                                                                                                                                                                                                481
                                                                                                                                                                                                                             541
                                                                                                                                                                                                                                                                                                                                                                                                       Pfam;
              121
                                            181
                                                                                        301
                                                                                                                                                                                                                                                                                                                                                                                                                                                          Best Loca
                             181
                                                           241
                                                                          241
                                                                                                       301
                                                                                                                      361
                                                                                                                                    361
                                                                                                                                                                  421
                                                                                                                                                                                                               541
                                                                                                                                                   421
                                                                                                                                                                                 481
121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         121
                                                                                                                                                                                                                                                   RESULT
Q9UWN9
              g
ò
                             ò
                                          a
                                                           õ
                                                                         g
                                                                                       οy
                                                                                                      QΩ
                                                                                                                      ò
                                                                                                                                    g
                                                                                                                                                   ò
                                                                                                                                                                 셤
                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                              ò
                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ô
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ð
```

```
GVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHM 180
                                                                                                                                                                   300
                                                                                                                                                                                                           360
                                                                                                                                                                                                                                                  360
                                                                                                                                                                                                                                                                                         420
                                                                                                                                                                                                                                                                                                                                  420
                                                                                                                                                                                                                                                                                                                                                                          480
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          CTRAIN-ATCC 35092 / DSM 1617 / P2;

STRAIN-ATCC 35092 / DSM 1617 / P2;

STRAIN-ATCC 35092 / DSM 1617 / P2;

MEDLINE-2133296; PubMed-1142776;

A Awayez M.J. Chan-Weiher C.C.-Y., Clausen I.G., Curtis B.A.,

De Moors A., Erauso G., Fletcher C., Gordon P.M.K.,

De Moors A., Erauso G., Fletcher C., Gordon P.M.K.,

A Haikamp-de Jong I., Jeffries A.C., Kocara C.J., Medina N., Peng X.,

A Thi-Ngor H.P., Raden P., Schenk M.E., Theriault C., Tolstrup N.,

Charlebois R.L., Doolittle W.F., Duguet M., Gaasterland T.,

A Garrett R.A., Ragan M.A., Sensen C.W., Van dea Oost J.;

The Complete genome of the crenarchaeon Sulfolobus solfataricus P2."

EMEL, Y08256, CA6650331;

EMEL, AR006815, AAK42272.1;

EMEL, AR006815, AAK42272.1;

InterPro; IPR0040461; Alpha_amylase.

BIT INTERPO: IPR004193; isoamylase.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             MTFAYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYV 60
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               P2.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ×
                                      03, Last sequence update)
19, Last annotation update)
(MALTO-OLIGOSYLTREHALOSE TREHALOHYDROLASE)
                                                                                                                                                                                                       YNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRKTHGE
                                                                                                                                                                                                                                                                                                                                                                                                                                                          LIKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFP
                                                                                                                        WIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEKCG
                                                                                                                                                                                                                                                                                         PVGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEY
                                                                                                                                                                                                                                                                                                              GEENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFYKI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Sulfolobales; Sulfolobaceae; Sulfolobus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      5;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Length
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ise; Complete proteome.
64370 MW; B00E403020F6B242 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           DB 17;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Pred. No. 3e-148;
; Mismatches 49;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Ā
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       561
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           82.8%; Score 2467; 79.7%; Pred. No. 3e
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Created)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Pfam; PF00128; alpha-amylase; 1. Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    63;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         541 QHIEEGKYEFDKGFALYKL 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             541 QHIEEGQYEFDKGFALYKL 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              03,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 01-MAY-1997 (TrEMBLrel.
01-DEC-2001 (TrEMBLrel.
ALPHA-AMYLASE PRECURSOR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Archaea; Crenarchaeota;
NCBI_TaxID=2287;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Hydrolase; Glycosidase;
SEQUENCE 561 AA; 6437
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           (TrEMBLrel.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    solfataricus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (TREZ) (EC 3.2.1.141)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Query Match
Best Local Similarity
Matches 447; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         01-MAY-1997 (
01-MAY-1997 (
01-DEC-2001 (
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Sulfolobus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   P95867
P95867;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            m
                                        181
                                                                               181
                                                                                                                      241
                                                                                                                                                                                                       301
                                                                                                                                                                                                                                                301
                                                                                                                                                                                                                                                                                       361
```

1;

m

5

```
PROSITE; PS00217; SUGAR_TRANSPORT_2; UNKNOWN_1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Q973H4;
01-DEC-2001
                    Hydrolase.
                                                     SEQUENCE
                                  NÔN_TER
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            0973Н4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ST0927
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Ŋ
                                                                                                                                                                                                                                                                                         62
                                                                                                                                                                                                                                                                                                                                                                                                      182
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           362
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               360
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   422
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       RESULT
0973H4
 ET SO
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ŏ
                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                             Óγ
                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                          δy
                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           δŽ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        QY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Maruta K., Mitsuzumi H., Nakada T., Kubota M., Chaen H., Fukuda S., Sugimoto T., Kurimoto M.;
"Cloning and sequencing of a cluster of genes encoding novel enzymes of trehalose biosynthesis from thermophilic archaebacterium Sulfolobus acidocaldarius.";
                                                                                                                       418
                                                                                                                                                                                                                                                                                                                                                                                                                                                                            478
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       540
                                                                                                                                                                                                                                                                                                                           CGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRKTH 358
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              480
                                MTFGYKLDEDGVTFNLWAPYQRKVKLKILNRGIYEMERDDKGYFTITLDNVRVGDRYKYI
                                                                                                        FEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVONSYGGPEGFRKLVDEA
                                                                                                                                                                                                                                                       EYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEK
                                                                                                                                                                                                                                                                                                                                                                                                    GEPVGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          EYGEENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFY
                                                                                                                                                                               HKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            χ.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Sulfolobus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Kato M., Kettoku M., Miura Y., Komeda T., Konishi Y., Shindo Kobayashi K., Iwamatsu A.;
Submitted (SEP-1995) to the EMBL/GenBank/DDBJ databases.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Archaea; Crenarchaeota; Sulfolobales; Sulfolobaceae; NCBI_TaxID=2285;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Last sequence update)
Last annotation update)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Biochim. Biophys. Acta 1291:177-181(1996).
EMBL; D64131; BAA11011.1; --
EMBL; D83245; BAA11863.1; --
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR001493; isoamylase.N.
InterPro; IPR001652; sub_transporter.
Pfam; PF00128; alpha-amylase; 1.
Pfam; PF00222; isoamylase.N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        556
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Created)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    MEDLINE=97135071; PubMed=8980629;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           FPQHIEEGKYEFDKGFALYKL 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Q53641; 008279; 008064; 01-NOV-1996 (TrEMBLrel. 01, 01-NOV-1996 (TrEMBLrel. 01, 01-DEC-2001 (TrEMBLrel. 19,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Sulfolobus acidocaldarius
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ALPHA-AMYLASE (FRAGMENT).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               [2]
SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   STRAIN=ATCC33909;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     053641
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    4
                                                                                                                                          121
                                                                                                                                                                               179
                                                                                                                                                                                                                 181
                                                                                                                                                                                                                                                     239
                                                                                                                                                                                                                                                                                       241
                                                                                                                                                                                                                                                                                                                           299
                                                                                                                                                                                                                                                                                                                                                                301
                                                                                                                                                                                                                                                                                                                                                                                                                                      361
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       481
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           541
                                  61
                                                                    61
                                                                                                      119
                                                                                                                                                                                                                                                                                                                                                                                                    359
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          419
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  479
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  40 2 3 4 1 1 2 2 3 4 1 1 2 2 3 3 4 1 2 2 3 3 4 1 2 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    RESULT
                                                                  셤
a
                                ŏ
                                                                                                      à
                                                                                                                                     ద
                                                                                                                                                                             δ
                                                                                                                                                                                                               g
                                                                                                                                                                                                                                               ŏ
                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                          ŏ
                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                  ö
                                                                                                                                                                                                                                                                                                                                                                                                                                  q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     셤
```

```
STRAIN-JCM 10545 / 7;

Pubmed-11572479;

Rawarabayasi Y., Hino Y., Horikawa H., Jin-no K., Takahashi M.,

Sekine M., Baba S.-I., Ankai A., Kosugi H., Hosoyama A., Fukui S.,

Nagai Y., Nishijina K., Otsuka R., Nakazawa H., Takamiya M., Kato Y.,

Yoshizawa T., Tanaka T., Kudoh Y., Yamazaki J., Kushida N., Oguchi A.,

Aoki K.-I., Masuda S., Yanagii M., Nishimura M., Yamagishi A.,

Oshima T., Kikuchi H.;
                                                                                                                                                                                                                                                                     122 VIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKK 181
                                                                                                                                                                                                                                                                                                                                                       241
                                                                                                                                                                                                                                                                                                                                                                                                                                                         241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         299
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   361
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          359
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        481
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     541
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          536
                                                                                                                                                                                                                                                121
                                                                                                                            Gaps
                                                                                                                                                                61
                                                                                                                                                                                                       61
                                                                                                                                                                                      S SFGGNIEKNKGIFKLMAPYVNSVKLK-LSKKLIPMEKNDEGFFEVEIDDIEENLTYSYII
                                                                                                                                                                                                                                                                                                                                                                                                                                        TFAYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVL
                                                                                                                                                                                                                                                DDASEIPDPASRYQPECVHGPSQIIQESKEFNNETFLKKEDLIIYEIHVGTFTPEGTFEG
                                                                                                                                                                                                                                                                                                                                                                                                                 GLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYW
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                242 IKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEKCGY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 302 NIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRTHGEP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       300 KIDAQWVDDFHHAVHAFIIKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRIHGAP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 VGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  EENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFYKIL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               482 IKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFPQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        480 INIRKRYN-NCKRVKEVREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGI--GFPK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Sulfolobus
                                                                                                                          7;
                                                                                   556;
                                                                                   Length
                                                                                                                          Indels
                       CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Archaea; Crenarchaeota; Sulfolobales; Sulfolobaceae;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Created)
Last sequence update)
Last annotation update)
                                                                               Query Match 58.7%; Score 1748.5; DB 1; Best Local Similarity 58.9%; Pred. No. 8.9e-103; Matches 329; Conservative 87; Mismatches 136;
                     4215B45E6C8ED4E7
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Ą
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              359
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              PRT;
                     MM.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   542 HIEEGK-YEFDKGFALYKL 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           537 KLKKDELIKVNRGVGVYQL 555
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     19,
  556
64373
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 01-DEC-2001 (TrEMBLrel.
01-DEC-2001 (TrEMBLrel.
01-DEC-2001 (TrEMBLrel.
PUTATIVE ALPHA-AMYLASE.
556
556 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Sulfolobus tokodaii
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                NCBI_TaxID=111955;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SEQUENCE FROM N.A.
```

us-09-298-924-6.rspt

```
э;
Э
                                                                                                                                                                                                                                                             261 TSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLT 320
                                                                                                                                                                                                                                                                                                       GERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRKRTHGEPVGELDGCNFVVYIQNHDQV 380
                                                                                                                                                                                                                                                                                                                                                                381 GNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQG 440
                                                                                                                                                                                                                                                                                                                                                                                                                        441 VREGRKKENGODTDPQDESTFNASKLSWKIDEEIFSFYKILIKMRKELSIACDRRVNVVN 500
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   for
                                                                                                                                                                               MVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAIID 260
                                                                                                                                                                                                Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   501 GENWLIIKGREYFSLYVFSKSSIËVKYSGTLLLSSNNSFPQHIEEGK-YEFDKGFALYK 558
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    299 TDNWLVIGLEKIFLLVAFSDTGLILRYNGELLFSTSD-FPKRIVSSKEIKVKKGVGVYK 356
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Redenbach M., Kleser H.M., Dengaite D., Eichner A., Cullum J., Kinashi H., Hopwood D.A.;
Kinashi H., Hopwood D.A.;
A set of ordered cosmids and a detailed genetic and physical map the 8 Mb Streptomyces coelicolor A3(2) chromosome.";
Mol. Microbiol. 21:77-96(1996).
EMBL, AL589708; CAC33923.1;
InterPro: IPR000461; Alpha_amylase.
Pfam: PF00128; alpha_amylase.
SEQUENCE 581 AA; 63952 MW; 8816DFF3BC1A3408 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Streptomyces coelicolor.
Bacteria; Firmicutes; Actinobacteria; Actinobacteridae;
Actinomycetales; Streptomycineae; Streptomyces.
                                                                                                                                                      4
                                                                                                                         Length 359;
"Complete genome sequence of an aerobic thermoacidophilic Crenarchaeon, Sulfolobus tokodaii strain7.";
DNA Res. 8:123-140(2001).
BMBL; APO00984; BAB65939-1; --
Hypothetical protein; Complete proteome.
SEQUENCE 359 AA; 41600 MW; 4D9F429099E81665 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          STRAIN-A3(2);
Cerdeno A.M., Parkhill J., Barrell B.G., Rajandream M.A.;
Submitted (MAR-2001) to the EMBL/GenBank/DDBJ databases.
                                                                                                                                                     71; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Submitted (MAR-2001) to the EMBL/GenBank/DDBJ databases
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Last sequence update)
Last annotation update)
                                                                                                                    ; Score 1269; DB 17;
; Pred. No. 1.1e-72;
51; Mismatches 71;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          581
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Created)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     STRAIN=A3(2);
MEDLINE-97000351; PubMed-8843436;
                                                                                                                       42.68;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    01-JUN-2001 (TrEMBLrel. 17, 01-JUN-2001 (TrEMBLrel. 17, 01-OCT-2001 (TrEMBLrel. 18, PUTATIVE ALPHA AMYLASE.
                                                                                                                      Query Match 42.6
Best Local Similarity 64.9
Matches 233; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       .
.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Harris
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           NCBI_TaxID=1902;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    STRAIN-A3(2);
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 SCBAC1A6.02C.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Seeger K.J.,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Q9ADI5
Q9ADI5;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ø
                                                                                                                                                                                                                                                                         61
                                                                                                                                                                                                                                                                                                     321
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           RESULT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Q9ADI5
 RT RT DR DR XW
                                                                                                                                                                                                             g
                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                        염
                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                           a
                                                                                                                                                                                                                                                                                                                                                                                                                        à
                                                                                                                                                                                                                                                                                                                                                                                                                                                    쉽
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   δ
```

```
13;
                                                                                                                                         70 PASRYQPEGVHGPSQIIQESKEFNNETFLKKEDL---IIYEIHVGTFTPEGTFEGVIRKL 126
                                                                                                                                                           DYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVI 186
                                                                                                                                                                                                                             SELVRLGVTHVELMPLCPFPGRHGWGYEGVSLWAVHEPYGGPEALKRFVDRAHDLGLGVV 177
                                                                                                                                                                                                                                                                           LDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWIKEYN 246
                                                                                                                                                                                                                                                                                              247 VDGFRLDAVHAIIDTSPKHILEEIADVVH-----KYNRIVIAESDLNDPRVVNPKEKCG 300
                                                                                                                                                                                                                                                                                                                                                                                                        301 YNIDAQWVDDFHHSIHAYLTGERQGYYTDFGN--LDDIVKSYKDVFVYDGKYSNFRRTH 358
                                                                                                                                                                                                                                                                                                                                                                                                                         GEPV--GELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFM 416
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        GRALDRGRVAAHRLTGYSQTHDQVGNRAQGDRLASLVSPGLAACAATLTLTAPFTPMLFM 417
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        GEEYGEENPFYFFSDFSDSKLIQGVREGRKKE-----NGQDT-DPQDESTFNASKLSWK 469
                                                                       14 FTLWAPYQKSVKLKVLEKGLYEMERDEK--GYFTITLNNVKVRD--RYKYVLDDASEIPD 69
                                                                                                      3 FEVWAPQAGRVTLR-CDGATRALERDPERPGWW---CGEAPARDGSRYGFAVDDGPVLPD 58
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    White O., Eisen J.A., Heidelberg J.F., Hickey E.K., Peterson J.D., Dodson R.J., Haft D.H., Gwinn M.L., Nelson W.C., Richardson D.L., Moffat K.S., Qin H., Jiang L., Pamphile W., Crosby M., Shen M., Vamathevan J.J., Lam P., McDonald L., Utterback T., Zalewski C., Makarova K.S., Aravind L., Daly M.J., Minton K.W., Fleischmann R.D., Ketchum K.A., Nelson K.E., Salzberg S., Smith H.O., Venter J.C.,
                                                                                                                                                                                                                                                                                                                                                           Bacteria; Thermus/Deinococcus group; Deinococcales; Deinococcus.
                                       39;
      Length 581;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         'Genome sequence of the radioresistant bacterium Deinococcus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            478 EPEREPHARVLDWYRRLIALRAEQPDLTDPDLADTRVAYDGTGRWLAFR 526
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        470 IDE-----EIFSFYKILIKMRKEL----SIACDRRVNVVNGENWLIIK 508
01-MAY-2000 (TrEMBLrel. 13, Created)
1-MAY-2000 (TrEMBLrel. 13, Last sequence update)
01-DEC-2001 (TrEMBLrel. 19, Last annotation update)
MALTOOLIGOSYLTREHALOSE TREHALOHYDROLASE, PUTATIVE.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       600 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     MEDLINE=20036896; PubMed=10567266;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Science 286:1571-1577(1999).
EMBL; AE001905; AAF10042.1;
TIGR; DR0464; -
                                       Matches 213; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Deinococcus radiodurans
                       Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        [1]
SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       NCBI_TaxID=1299;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          radiodurans R1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Fraser C.M.;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          STRAIN=R1;
          Query Match
                       Best Local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        29RX51;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DR0464.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     09RX51
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        7
                                                                                                                                                                                                                                                                           187
                                                                                                                                                                                                                                                                                                                                                                         238
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        358
                                                                                                                                                                                                          127
                                                                                                                                                                                                                                       118
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       417
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       418
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Q9RX51
                                                                                                        q
                                                                                                                                       δλ
                                                                                                                                                                      g
                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                     Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ð
                                                                                                                                                                                                                                                                         ŏ
                                                                                                                                                                                                                                                                                                        q
                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        δ
```

S

```
EMBL; AE004643; AAG05552.1;
                                                                                                                                                                                                                          Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          STRAIN=1021;
                                                                                                                                                                                                                                                   203;
                                                                                                                                                                                                        Query Match
Best Local S
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Q92U63
                                                                                                                                                                                                                          Best Loca
Matches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               289
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    285
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          344
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 404
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   453
         DR DR DR SO S
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                   ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                 20;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           316
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               372 AVKGEEHERGHPSDALEAPNFVYCIQNHDQIGNRPLGERLHQSDGVTLHEYRGAAALLL- 430
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   - HIST - HIST - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - HISTORY - 
                                                                                                                                                                                                                                                                                                              SEIPDPASRYQPEGVHGPSQIIQESKEFNNETF------LKKEDLIIYEIHVGTFTP 115
                                                                                                                                                                                                                                                                                                                                       - PTPDDPYARFLPDGVHGEAEVV----DFG--TFDWTDADWHGIKLADCVFYEVHVGTFTP 139
                                                                                                                                                                                                                                                                                                                                                                                                   EGTFEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLV 175
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        407
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  293 VNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDF-GNLDDIVKSYKDVFVYDGKYS 351
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           317 VTVN-----HLDGIWTDDFHHETRVTLTGEQEGYYAGYRGGAEALAYTIRRGWRYEGQFW 371
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             STRAIN=ATCC 15692 / PAO1;
STRAIN=ATCC 15692 / PAO1;
MEDIINE-2013737 PAO1;
MEDIINE-2013737 PAO1;
MEDIINE-2013737 PAO1;
MEDIINE-2013737 PAO1;
Hickey M.J., Brinkman F.S.L., Hufnagle W.O., Kowalik D.J., Lagrou M., Garber R.L., Goltry L., Tolentino E., Westbrock Wadman S., Yuan Y., Smith K.A., Spencer D.H., Wong G.K.-S., Wu Z., Paulsen I.T., Reizer J., Saier M.H., Hancock R.E.W., Lory S., Olson M.V.;
Complete genome sequence of Pseudomonas aeruginosa PAO1, an Opportunistic pathogen.";
Nature 406:959-964(2000).
                                                                                                                                                                                                                                                                   FRLWTSTARTVAVRVNGTEHVMTSLGGGIYELELP------VGPGARYLFVLDGV 86
                                                                                                                                                                                                                        FTLWAPYQKSVKLKV-----LEKGLYEMERDEKGYFTITLNNVKVRDRYKYVLDDA 64
                                                                                                                                                                                                                                                                                                                                                                                                                            257 TGNARMULRDYHFDGLRLDATPYMTDDSETHILTELAQEIHELGGTHLLLAEDHRNLPDL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DEAHKKGLGVILDVVYNHVGPEGNYMVKLGP-YFSQKYKTPWGLTFNFDDAESDEVRKFI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                LENVEYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKY -- NRIVIAESDLNDPRV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      352 NFRRKTH--GEPVGELDGCNFVVYIQNHDQVGNRGKGERIIKL--VDRESYKIAAALYLL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            408 SPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE-----NGQDT-DPQDES
                                                                                                                                      600;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Bacteria; Proteobacteria; gamma subdivision; Pseudomonadaceae;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 460 TFNASKLSWKIDE----EIFSFYKILIKMRKELSIACDR-RVNVVNGEN 503
                                                                                                                                    DB 16; Length
                                                                                                                                                                               86; Mismatches 170; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Pfam; PF00128; alpha-amylase; 1.
Pfam; PF02922; isoamylase_N; 1.
Hydrolase; Complete proteome.
SEQUENCE 600 Aa; 66909 MW; 594091EC093F8A44 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Last sequence update)
Last annotation update)
                                                                                                                                    30.4%; Score 905.5; DB 1
38.7%; Pred. No. 2.3e-49;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Ź
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         583
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Created)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  16,
16,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                PROBABLE GLYCOSYL HYDROLASE
                                                                                                                                                                               Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                01-MAR-2001 (TrEMBLrel.
01-MAR-2001 (TrEMBLrel.
01-OCT-2001 (TrEMBLrel.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Pseudomonas aeruginosa
                                                                                                                                                          Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           NCBI_TaxID=287;
                                                                                                                                                          Best Local Sim
Matches 205;
                                                                                                                                    Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                0911V1;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     0911V1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              œ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          489
                                                                                                                                                                                                                          14
                                                                                                                                                                                                                                                                   38
                                                                                                                                                                                                                                                                                                                 65
                                                                                                                                                                                                                                                                                                                                                                                                   116
                                                                                                                                                                                                                                                                                                                                                                                                                                              140
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       176
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             235
                                                                                                                                                                                                                                                                                                                                                       87
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   431
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              RESULT
      SW WW
                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                 셤
                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                   δ
                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                В
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ŏ
```

```
19;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        66 DGRPGVPDPASQFQPDGVHGHSQVLDHGTYAMRVDEWRGRPW---HEAVIYELHVGLF-- 120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   116 EGTFEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLV 175
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            342
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | | ||:| ||::||||| || ||:||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:|| ||:||
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      176 DEAHKKGLGVILDVVYNHVGPEGNYMVK-LGPYFSQKYKTPWGLTFNFDDAESDEVRKFI 234
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             SDLNDPRVVNPKEKCGYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGN-LDDIVKSYKDV 343
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          62 DDASEIPDPASRYQPEGVHGPSQIIQES - - - - KEFNNETFLKKEDLIIYEIHVGTFTP 115
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          235 LENVEYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIA------DVVHKYNRIVIAE 284
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      FVYDGKYSNFRRKTHGEPVGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAA 403
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             343 FVYQGE-ANRHGRPRGEPSADLAPDAFVLFLQNHDQVGNRAFGERLSVLAEPQALRLAIA 401
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             65
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           FAYKIDGN-EVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Bacteria; Proteobacteria; alpha subdivision; Rhizobiaceae group; Rhizobiaceae; Sinorhizobium.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               87;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               LYLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKENGQD-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   -TDPQDESTFNASK-----LSWKIDEEIFSFYKILIKMRKELSI-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Length
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Finan T.M., Weidner S., Wong K., Buhrmester J., Chain P.,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          174; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 092063;
01-DEC-2001 (TrEMBLrel. 19, Created)
01-DEC-2001 (TrEMBLrel. 19, Last sequence update)
01-DEC-2001 (TrEMBLrel. 19, Last annotation update)
PUTATIVE 1,4-ALPHA-GLUCAN BRANCHING ENZYME PROTEIN (EC
                                                                                                                                                                                                                                                                                                   651CD7A918833E00 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   16;
InterPro: IPR002086; Aldehyde_dehydr.
InterPro: IPR002086; Aldehyde_dehydr.
InterPro: IPR000461; Alpha_amylase.
Pfam; PF00128; alpha-amylase; 1.
PROSITE; PS00070; ALDEHYDE_DEHYDR_CYS; UNKNOWN_1.
Hydrolase; Complete proteome.
SEQUENCE 583 AA; 65657 WW; 651CD7A918833E00 C
                                                                                                                                                                                                                                                                                                                                                                                                                                                             29.6%; Score 881.5; DB 10.36.3%; Pred. No. 7.3e-48; Live 95; Mismatches 174
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         2.4.1.18).
Rhizoblum meliloti (Sinorhizoblum meliloti).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               601
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               MEDLINE-21396508; PubMed-11481431;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             515 AGAALSARWRLGDGSDWRI 533
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      491 --- ACDRRVNVVNGENWLI 506
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               PRELIMINARY;
```

```
STRAIN=M3;
                                                                                                                                                                                                                                                                                                             Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Q44528
Q44528;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           99
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    RESULT
            RA
RA
RA
RT
RT
RT
SQ
SQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DDT ACC DD
                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    QΥ
                                                                                                                                                                                                                                                                                                             19;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ::|||||||| |||||||| 428 LLFWGEEYGETQPFYFFSDY-QGEIAAAIRLGRRDEAENFGGLPEGKTMDDLPDPLDPDV 486
                                                                                                                                                                                                                                                                                                                                                                                                                                                67 IPDPASRYQPEGVHGPSQIIQESK-EFNNETFLKK--EDLIIYEIHVGTFTPEGTFEGVI 123
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         124 RKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGL 183
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     184 GVILDVVYNHVGPEGNYMVKLGP-YFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYWI 242
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              243 KEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHK---YNRIVIAESDLNDPRVVNPKEKC 299
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                374 EGSRARVPPQGRVN-----FLQNHDQIGNRAFGERLASLLQEDSLRVLAAMHMLTPQIP 427
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               MIFMGEEYGEENPFYFFSDFSDSKLIQGVREGRKKE-----NGQD----TDPQDEST 460
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  487 FAGSKLRWNRATSPAGERHLAYVRDLAVIRQRHIVPLIAGTAVPDGRAYETKDGIIAVDW 546
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        300 GYNI--DAQWVDDFHHSIHAYLTGERQGYYTDFGN--LDDIVKSYKDVFVYDGKYSNFR- 354
                                                     Š
                                                                                                                                                                                                                                                                                                             Gaps
                                                                                                                                                                                                                                                                                                                                                                                   19 IDSDICRFREMAAPDEREVDL-VLGGAVHKMQSLDCGWFEIIL-AAKAGERYCFRLADGTE 76
Vorhoelter F.J., Hernandez-Lucas I., Becker A., Cowie A., Gouzy J., Golding B., Puehler A.;

"The complete sequence of the 1,683-kb pSymB megaplasmid from the Nitring endosymbion: Sinchizobium meliloti.";

Proc. Natl. Acad. Sci. U.S.A. 98:9889-9894(2001).

EMBL, AL603646; CAC49676.1;

Transferase: Glycosyltransferase; Plasmid; Hypothetical protein;
                                                                                                                                                                                                                                                                                                                                                      IDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVLDDASE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     355 -- RKTHGEPVGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      461 FNASKLSWK----IDEEIFSFYKILIKMRK---------------
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Sulfolobus
                                                                                                                                                                                                                                                                                                             77;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Kawarabayasi Y., Hino Y., Horikawa H., Jin-no K., Takahashi M.,
                                                                                                                                                                                                                                                               Length 601;
                                                                                                                                                                                                                                                           Ouery Match 29.4%; Score 876.5; DB 16; Length Best Local Similarity 35.3%; Pred. No. 1.6e-47; Matches 207; Conservative 99; Mismatches 204; Indels
                                                                                                                                                                                            024DA322A7B72C2E CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               487 ELSIAC-DRRVNVVNGENWL-IIKGREYFSLYVFSKSSIEVKYSGTL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            GEGEACLELRVNLLHETHAVPAIRGQPIFT---SETSSVETVYGSEL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Archaea; Crenarchaeota; Sulfolobales; Sulfolobaceae;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Created)
Last sequence update)
Last annotation update)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Ą.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               PRT;
                                                                                                                                                                                            601 AA; 66954 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      (TrEMBLrel. 19, (TrEMBLrel. 19, I
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         0973H5;
01-DEC-2001 (TrEMBLrel.
01-DEC-2001 (TrEMBLrel.
01-DEC-2001 (TrEMBLrel.
01-DEC-2001 (TrEMBLrel.
PUTATIVE ALPHA-AMYLASE.
ST0926.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SEQUENCE FROM N.A.
STRAIN-JCM 10545 / 7;
PubMed-11572479;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Sulfolobus tokodaii.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       NCBI_TaxID-111955;
                                                                                                                                                                      Complete proteome
                                                                                                                                                                                            SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               413
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           547
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 RESULT
Q973H5
    a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 qq
                                                                                                                                                                                                                                                                                                                                                         õ
                                                                                                                                                                                                                                                                                                                                                                                               a
                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                δý
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         임
```

```
4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             22;
Sekine M., Baba S.-I., Ankai A., Kosugi H., Hosoyama A., Fukui S., Nagai Y., Nishijima K., Otsuka R., Nakazawa H., Takamiya M., Kato Y., Yoshizawa T., Tanaka T., Kudoh Y., Yamazaki J., Kushida N., Oguchi A., Aoki K.-I., Masuda S., Yanagii M., Nishimura M., Yamagishi A., Oshima T., Kikuchi H.;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          70 PASRYQPEGVHGPSQIIQESKEF-NNETFLKKEDLIIYEIHVGTFTPEGTFEGVIRKLDY 128
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            LKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVILD 188
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                -----EIPDPASRYQPEGVHGPSQIIQESKEFNN--ETFLKKED------LIIYEI 108
                                                                                                                                                                                                                                                                                                                                                                                                                            10 NEVIFTLWAPYOKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKYVLDDASEIPD 69
                                                                                                                                                                                                                                                                                                                                                                                                                                                     10 NEVEFILWAPYQKKATLRLNEE-KYDMEKDEKGYFRITV-NAKEGBKYSFII-DKGEIPD 66
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      to alpha-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          FTLWAPYQKSVKLKVLEKGLYE--MERDEKGYFTITLNNVKVRD---RYKYVLDDAS---
                                                                                                                                                                                                                                                                                                                                                                                   4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Indels 129;
                                                                                                                                                                                                                                                                                                                          Length 217;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Bacteria; Cyanobacteria; Nostocales; Nostocaceae; Anabaena.
NCBL_TaxID=1172;
                                                                                                                        "Complete genome sequence of an aerobic thermoacidophilic Crenarchaeon, Sulfolobus tokodaii strain7.";
DNA Res. 8:123-140(2001).
EMBL; APO00984; BAB65938.1; --
Hypothetical protein; Complete proteome.
SEQUENCE 217 AA; 25181 MW; 4A1235EC5B491CEF CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  gene lti2 from the that is homologous
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Length
                                                                                                                                                                                                                                                                                                                                                                              Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   63833 MW; 069886FAFD8FC411 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               01-NOV-1996 (TrEMBLrel. 01, Created)
01-NOV-1996 (TrEMBLrel. 01, Last sequence update)
01-DEC-2001 (TrEMBLrel. 19, Last annotation update)
PUTATIVE ALPHA-GLUCANOTRANSFERASE /HYDROLASE.
                                                                                                                                                                                                                                                                                                                                                                              36;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          17.6%; Score 524.5; DB 2; 28.0%; Pred. No. 2.7e-25; iive 90; Mismatches 162;
                                                                                                                                                                                                                                                                                                                        Score 706; DB 17;
Pred. No. 2.4e-37;
}; Mismatches 36;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   552 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Sato N.; "Cloning of a low-temperature-induced cyanobacterium Anabaena variabilis M3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     amylases.";
plant Mol. 18:165-170(1992).
EMBL; X9279; CAA41970.1; -.
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase.N.
Fran; Pr00128; alpha-amylase.N.
Pfam; Pr02922; isoamylase.N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 MEDLINE=92119230; PubMed=1731972;
                                                                                                                                                                                                                                                                                                                                                                           28;
                                                                                                                                                                                                                                                                                                                          23.7%;
66.0%;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          189 VVYNHVGPEGNYMVKLGPYF 208
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    187 VVYNHVGPEGNYMMFLGPYY 206
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Conservative
                                                                                                                                                                                                                                                                                                                                                                              Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Hydrolase
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     552 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Anabaena variabilis
                                                                                                                                                                                                                                                                                                                                                      Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Query Match
Best Local Similarity
Matches 148; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ransferase;
                                                                                                                                                                                                                                                                                                                                                    Best Local Simi
Matches 132;
```

~

31;

```
Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       093035
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          RESULT 13
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         151
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      201
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  207
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             261
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            260
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         319
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           475
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  101
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              375
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              465
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             093035

1D 099

1D 009

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011

1D 011
  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             윤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     q
                                                                                                                                                                                                                                                                                                                                                                   ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ö
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    δ
                                                                                                                                                                                ::|||| :||||| |::|: :|: || || || ESSYGSTADLKKLVDECHQRGIRIIMDGIYNHSEASSPLTQIDHDYWYHHEPRDPDNNWG 242
                                                                                                                                                                                                                                                                                                                                                                   303 TAGAKPFYN---VAEHIPETTSITNLDGPMDGC-----WHDSFYHIKAHICGDT--- 349
EEDQWVDYTDPYATDIDES-SGKDNSIARIKDGEKIVDTYVWQHDDKPLPADHELVIYEL 122
                                                                                         YTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGEPVGELDGCNFVVYIQNHD-----QV 380
                                                                                                                                                         QNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHVGPEGNY-MVKLGPYFSQKYKTP---WG 217
                                                                                                                                                                                                                                                LTFNF----DDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAIIDTSPKHIL----EE 269
                                                                                                                                                                                                                                                                                                                                       270 IADVVHKYNRIVIAESDLNDPRVVN---PKEKCGYNIDAQWVDDFHHSIHAYLTGERQGY 326
                                                                                                                                                                                                                                                                                                                                                                                                                                                                           350 -FDLENLKDVI------DPKRQGF-----LGATNVVNYLTNHDHDHIMVEL 388
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        GNRGKGERIIKLVDRESY---KIAAALYLLSPYIPMIFMGEEYGEENPFYFFSDFSDSKL 437
                                                                 HVGTFT-----PEGTFEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAV 161
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           M., Imanaka T.;
branching enzyme
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             059242; 008511; 008485;
01-NOV-1996 (TTEMBLrel. 01, Created)
01-NOV-1996 (TTEMBLrel. 01, Last sequence update)
01-BC-2001 (TTEMBLRel. 19, Last annotation update)
1,4-ALPHA-GLUCAN BRANCHING ENZYME (EC 2.4.1.18)
GLYCOGEN BRANCHING ENZYME) (1,4-ALPHA-GLUCAN BRANCHING ENZYME)
(AMYLO-(1,4 TO 1,6)-TRANSGLUCOSIDASE)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                OF.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          PATHWAY: THIRD STEP IN GLYCOGEN BIOSYNTHESIS.
MISCELLANEOUS: OPTIMAL ACTIVITY AT APPROXIMATELY 39 DEGREES
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                CATALYTIC ACTIVITY: FORMATION OF 1,6-GLUCOSIDIC LINKAGES
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           to the EMBL/GenBank/DDBJ databases
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Takata H., Takaha T., Okada S., Takagi M., Imanaka T.;
Submitted (APR-1997) to the EMBL/GenBank/DDBJ databases
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 IQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFYKILIKMRK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     GNR-----EIFHDEAFRRAKLGTAILMTAVGVPLIWMGEEFGEYKP-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          STRAIN=TRBE14;
MEDLINE=95031021; PubMed=7944355;
Takata H., Takaha T., Kuriki T., Okada S., Takagi I Properties and active center of the thermostable from Baciluus stearothermophilus.";
Appl. Environ. Microbiol. 60:3096-3104(1994).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Bacteria; Firmicutes; Bacillus/Clostridium group;
Bacillus/Staphylococcus group; Geobacillus.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ¥.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Bacillus stearothermophilus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Takata H.;
Submitted (AUG-1996)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    [1]
SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               NCBI_TaxID=1422;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 STRAIN-TRBE14;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     GLYCOGEN.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              STRAIN=TRBE14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       CELSIUS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    rakata
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             059242
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                12
                                                                                                                                                      162
                                                                                                                                                                                                                                                218
                     64
                                                                                                                                                                                                   183
                                                                                                                                                                                                                                                                                                                                                                                                                                   327
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          381
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              430
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  RESULT
                                                                                                                                                                                                 원
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                          셤
                                                                                                                                                    ò
                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                       ŏ
                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               δ
```

```
260
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       474
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ENLEGHLYKYELVIPDGQVLFKADPYAFYSELRPHTAS-IAYDLKGYQWNDQSWKRKKRR 140
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          311
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           419
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 464
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            482
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   NVKVRDRYKY -- VLDDASEI -- PDPASRYQPEGVHGPSQIIQESK -- EFNNETFLKK -- 100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ----EDLIIYEIHVGTF-TPEGTF----EGVIRKLDYLKDLGITAIEIMPIAQFPGKRD 150
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   371
                                                                                                                                                                                                                                                                                                                                                                                    Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                       4 AYKIDGNEVI-----FTLWAPYQKSVKL----KVLEKGLYEMER-DEKGYFTITLN 49
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      SYELFGAHVINEGGKVGTRFCVWAPHAREVRLVGSFNDWDGTDFRLEKVNDEGVWTIVVP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      WGYDGVYLYAVQNSYGGPEGFRKLVDEAHKKGLGVILDVVYNHV--GPEGNYMVKLGP--
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      312 HHSIHAYLIGERQGYYIDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHGEPVGELDGCNFV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                [1]
SEQUENCE FROM N.A.
Uski T., Inouye S.;
"Identification of a new His-Asp phosphorelay signal transduction
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  -YFSQKYKT--PWGLTFNFDDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAII----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          -----DTSPKHILEEIADVVHKY--NRIVIAESDLNDPRVVNPKEKCGYNIDAQWVDDF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             NDRLYENPYAVEFLRKLNEAVFAYDPNALMIAEDSTDWPKVTAPTYEGGLGFNYKW----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  372 VYIQN------HDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYI-----PMIFMGEE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       420 YGEENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEI----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            -----WKFEDELDWVLF
                                                                                                                                                                                                                                                                                                                            13.4%; Score 399; DB 2; Length 652; 25.2%; Pred. No. 3e-17; tive 96; Mismatches 189; Indels 158;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  -FSFYKILIKMRKELSIACDRRVNVV-----NGENWLIIKGREYFSLYVF 518
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Bacteria; Proteobacteria; delta subdivision; Myxobacteria;
Myxococcales; Cystobacterineae; Myxococcaceae; Myxococcus.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  483 DFELHRKMNDYMKEL-IACYKRYKPFYELDHDPQGFEWIDVHNAEQ-SIFSF
                                                                                                                                 Glycogen biosynthesis; Transferase, Glycosyltransferase.
ACT_SITE 308 308 BY SIMILARITY.
ACT_SITE 351 351 BY SIMILARITY.
ACT_SITE 419 419 BY SIMILARITY.
SEQUENCE 652 AA; 76793 MW, 4591BB414A0E3FEF CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          01-DEC-2001 (TrEMBLrel. 19, Created)
01-DEC-2001 (TrEMBLrel. 19, Last sequence update)
01-DEC-2001 (TrEMBLrel. 19, Last annotation update)
BRANCHING ENZYME GLGB (FRAGMENT).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             440 AA
EMBL; D87026; BAA19588.1; -.
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       -----FAQFDE-----
                                                                         Pfam; PF00128; alpha-amylase; 1. Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                    Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Myxococcus xanthus.
                                                                                                                                                                                                                                                                                                                                                        Best Local Similarity
Matches 149; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    NCBI_TaxID=34;
```

œ

```
[2]
SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             NCBI_TaxID=44001;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            saccharolyticus.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      059319
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        RESULT 15
Q59319
                                                                                                                     435
                                                                                                                                                              88
                                                                                                                                                                                                              483
                                                                                                                                                                                                                                                            137
                                                                                                                                                                                                                                                                                                                                                     171
                                                                                                                                                                                                                                                                                                                                                                                                                                              228
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                148
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         493
                            9
                                                                     Qγ
                                                                                                                 g
                                                                                                                                                            δy
                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                          δ
                                                                                                                                                                                                                                                                                                Dp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                   Ω
                                                                                                                                                                                                                                                                                                                                                                                            рþ
                                                                                                                                                                                                                                                                                                                                                                                                                                              δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                QΥ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  οŽ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                    23;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        34;
                                                                                                                                                                                                                                                                                                                                                                    62 DDASEIPDPASRYQPEGVHGPSQIIQESKEF.-NNETFLKK--EDLIIYEIHVGTF--TP 115
                                                                                                                                                                                                                                                                                                                                                                                                                                                               ---EGTFEGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFR 172
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             242
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 325
                                                                                                                                                                                                                                                                                                                                                                                                   184
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      DDAESDEVRKFILENVEYWIKEYNVDGFRLDAVHAI----IDTSPKHILEEIADVVHKY 277
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        300 NREINATOPWKISIAEDFGGGDFITNDATSDTSGGAGFDSQWGGDFVHAIRAAVIAS--- 356
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          383
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       --NDSGR---DMNSVRNAITQRYSGRHT------ARVIYSESHDEVAN- 393
                                                                                                                                                                                                                                       Gaps
                                                                                                                                                                                                                                                                                                                             67
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Gaps
                                                                                                                                                                                                                                                                           14 FTLWAPYQKSVKLKVLEKGLY-----EMERDEKGYFTITLNNVKVRDRYKYVL---- 61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              8 DGNEVIFTLWAP-----YQK----SVKLKVLEKGLYEMERDE-----KG 42
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       KLVDEAHKKGLGVILDVVYNHVGP------EGNYMVKLGPYFSQKYK--TPWGLTFNF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   FRVWAP----MASRVFVSGDFNGWGTWIELGNEFNGNFSGDVAGAVKGQKYKFITRNQWG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 PDYGRPEVRAYIRDSMMNLTHSFRGDGLRWDATKYMRTQNGSDTT----AIPDAWRVFRSI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               NR----IVIAESDLNDPRVVN---PKEKCGYNIDAQWVDDFHHSIHAYLTGERQG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      326 YYIDFGNLDDIVKSYKDVFV--YDGKYSNFRRKTHGEPVGELDGCNFVVYIQNHDQVGNR
    οţ
                                                                                                                                                                                                                                  98;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     261;
system which regulates expression of a heat shock gene, lonD,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Length 1142;
                                                                                                                                                                                    Length 440;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              || |: : : : : : : | | |||| |:||: | GKA-RVPEEIWPGNAGSWAAKKRSTLAAGVVFTSPGIPMIFQGQEFLE 440
                                                                                                                                                                                                                               75; Mismatches 164; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 GKGERIIKLV-----DRESYKIAAALYLLSPYIPMIFMGEEYGE 422
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              "alkaline pullulanase from the alkaliphilic bacterium.";
Submitted (OCT-2000) to the EMBL/GenBank/DDBJ databases.
EMBL; AB049812; BAB47586.1; -
SEQUENCE 1128.759 WW; 318FC01362961E84 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Indels
                   Myxococcus xanthus.";
Submitted (JUL-2000) to the EMBL/GenBank/DDBJ databases
EMBL; ARY285783; AAK83002.1; -.
NON_TER 440 440
                                                                                                              440 AA; 48964 MW; 8D492EA5A4A92017 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Last sequence update)
Last annotation update)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     13.3%; Score 395.5; DB 2;
larity 22.9%; Pred. No. 1.1e-16;
Conservative 100; Mismatches 190;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Bacteria; Firmicutes; Bacillus/Clostridium group; Bacillus/Staphylococcus group; Bacillus.
                                                                                                                                                                                    13.3%; Score 397; DB 2; 28.0%; Pred. No. 2.3e-17;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Æ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                PRT; 1142
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Created)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      (TrEMBLrel. 19, (TrEMBLrel. 19, (TrEMBLrel. 19,
                                                                                                                                                                                                          Best Local Similarity 28.09
Matches 131; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Bacillus sp. KSM-1876.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ALKALINE PULLULANASE. PUL1876.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           SEQUENCE FROM N.A. STRAIN-KSM-1876;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Hatada Y., Ito S.;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         01-DEC-2001
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               01-DEC-2001
01-DEC-2001
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   164;
                                                                                                              SEQUENCE
                                                                                                                                                                                    Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           093UZ9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 243
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Best Loca
Matches
                                                                                                                                                                                                                                                                                                                                                                                                                 89
                                                                                                                                                                                                                                                                                                                                                                                                                                                               116
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          125
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   185
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               384
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          394
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           173
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      223
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                RESULT
Q93UZ9
RT RT SS ET SS
                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                                                               a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              AC DATE OF THE STATE                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ٠
```

÷

```
ESKEFNNETFLKKEDLIIYEIHVGTFTPE------GTFEGVIRKLDYLKDLGITA 136
                                                                                                                                                                                               IEIMPIAQF----GPEKRD-----G 170
                                                                                                                                                                                                                                                                                                                                             ------DEVRKFILENVEYWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVH 275
                                                                                                                                                                                                                                                                                                                                                                    793
                  434
                                                                                                                                                                                                                          227
                                                                                                                                                                                                                                                                                                                                                                                                                                        315 IHA-----YLTGERQGYYTDFGNLD---DIVKSYKDVFVYDGKYSNFRRKTHGEPV 362
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    363 GELDGCNFVVYIQNHDQVGNRGKGERIIKLVDR-----ESYKIAAALYLLSPYIP 412
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        -----EEN--PF---YFFSDFSDSKLIQGVREGRKK 447
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ENGQDTDPQDEST-----FNASKLSWK -- IDEEIFSFYKILIKMRKELSIAC 492
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     908 TNA-DAYPIQNLTREYTTGLIELRRSSDAFRLGTKDLVDEKV---TQLNIPEIEETDLVV 963
                                                     87
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  saccharolyticus)
YY-----YHYEIDHDGDKKIALDPYAKSLSAWNSDEQGPYAKAAIVDPSSIGP
                                                                                                                                                43 YFTITLNNVKVRDRYKYVLD---DASEIPDPASR-----YQPEGVHGPSQIIQ
                                                                                                                                                                                                                                                                       FRKLVDEAHKKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAES ---
                                                                                                                                                                                                                                                                                                                                                                                                                   276 KY----NRIVIAE-----SDLNDPRVVNPKEKCGYNIDAQWV------DDFHHS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          348 FLHAGQEYGRTKQFRAETSEPPYKSTYMTDENGEPFRYPYFIHDSYDSTDIINRFDWERA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                extremely
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               DRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFPQHIEEGK 547
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              an
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         to the EMBL/GenBank/DDBJ databases
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Albertson G.D., McHale R., Gibbs M.D., Bergquist P.L., "Cloning and expression of a type II pullulanase from a thermophilic anaerobic bacterium, Caldicellulosiruptor
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  01-NOV-1996 (TrEMBLrel. 01, Created)
01-NOV-1996 (TrEMBLrel. 01, Last sequence update)
01-DEC-2001 (TrEMBLrel. 19, Last annotation update)
ALPHA-DEXTRIN 6-GLUCANOHYDROLASE (EC 3.2.1.41).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Caldocellum saccharolyticum (Caldicellulosiruptor Bacteria; Firmicutes; Bacillus/Clostridium group; Thermoanaerobacter group; Caldicellulosiruptor.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Ŕ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   825
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               3ur. J. Biochem. 0:0-0(1995)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Gibbs M.D.;
Submitted (AUG-1996) to the
EMBL; L39876; AAB06264.1;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          113 MIFMGEEYG-----
```

```
31;
                                                                                                                                                                                                                                                280 DEGYIVYHVPDPYSKASSSN-SGKSYIFDPADGLIDGWQADSFVDNIEKQDDAIIYEMHY 338
                                                                                                                                                                                           220 FRLWAPTAYKVKIQIFDEHENFKFGKEMSRAENGTWDVYLPGDLKNHFYLYEIWHYNYED 279
                                                                                                                                                                                                                               64 ----ASEIPDPASRYQPEGVHGPSQIIQES----KEFNNETFL----KKEDLIIYEIHV 110
                                                                                                                                                                                                                                                                                        194 ------VGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVE 239
                                                                                                                                                                                                                                                                                                                                                                                                                        457 TYHTKGGKFSIFDKIVPE--YFYRVDDYGDYSNATGCG---NELATEKPMVRKFILDTII 511
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      DVFVYDGKYSNFRRKTHGEPVGELDGCNFVVYIQNHDQVGNRGK-----GERIIKLVDR 395
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                146 --PGKR-DWGYDGV----YLYAVQNSYGGPEGFRKL---VDEAHKKGLGVILDVVYNH 193
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              292 VVNPKEKC--GYNIDAQWVDDFHHSIHAYLTGERQGYYTDF---GNLDDI-----VKSYK 341
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     396 ESYKIAAALYLLSPYIPMIFMGEEY----GEENPFYFFSDFSDSKLIQGVREGRKKENG 450
                                                                                                                Query Match 12.8%; Score 381.5; DB 2; Length 825;
Best Local Similarity 25.7%; Pred. No. 5.2e-16;
Matches 149; Conservative 86; Mismatches 170; Indels 175; Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                               240 YWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYN------RIVIAESDLNDPR 291
                                                                                                                                                                          FTLWAPYQKSVKLKVLE-----KGLYEMERDEKGYFTITL-----NNVKVRDRYKYVLDD 63
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   AN-----
InterPro; IPR000461; Alpha_amylase.
InterPro; IRR004193; isoamylase_N.
Pfam; PF00128; alpha-amylase; 1.
Pfam; PF02921; isoamylase_N; 1.
Hydrolase; Glycosidase.
SEQUENCE 825 AA; 95732 MW; 92C2082E9B35F5AD CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             342
    ò
                                                                                                                                                                                              QQ
                                                                                                                                                                                                                               δ
                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                            a
                                                                                                                                                                                                                                                                                                                                              δ
                                                                                                                                                                                                                                                                                                                                                                     Q
                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                         οp
                                                                                                                                                                                                                                                                                                                                                                                                                                                           Qy
Db
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ογ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   õ
```

Search completed: July 15, 2002, 12:24:08 Job time: 390 sec



```
c
                                                                                         July 15, 2002, 12:17:32; Search time 58.93 Seconds (without alignments) 1047.973 Million cell updates/sec
                                                                                                                                                                                   1 MFSFGGNIEKNKGIFKLWAP......KLKKDELIKVNRGVGVYQLE
                                                                                                                                                                                                                                                                                         747574
            4.5
Compugen Ltd.
                                                                                                                                                                                                                                                                                     Total number of hits satisfying chosen parameters:
                                                                                                                                                                                                                                                           747574 seqs, 111073796 residues
            GenCore version
Copyright (c) 1993 - 2000
                                                                                                                                                                                                                                                                                                                                                           Post-processing: Minimum Match 0%
Maximum Match 100%
Listing first 45 summaries
                                                                      sw model
                                                                                                                                                                                                                BLOSUM62
Gapop 10.0 , Gapext 0.5
                                                                   protein search, using
                                                                                                                                                                                                                                                                                                                   length: 0
length: 2000000000
                                                                                                                                                                                                                                                                                                                                                                                                                         A_Geneseq_032802
                                                                                                                                                        US-09-298-924-8
2954
                                                                                                                                                      Title:
Perfect score:
Sequence:
                                                                                                                                                                                                                                                                                                                     sed
                                                                                                                                                                                                                  Scoring table:
                                                                   1
                                                                                                                                                                                                                                                                                                                  DB
                                                                   OM protein
                                                                                                                                                                                                                                                           Searched:
                                                                                                                                                                                                                                                                                                                                                                                                                        Database
                                                                                                                                                                                                                                                                                                                  Minimum I
Maximum I
                                                                                               Run on:
```

1: /SIDS1/gcgdata/hold-geneseg/genesegp-embl/AA1980.DAT:*
2: /SIDS1/gcgdata/hold-geneseg/genesegp-embl/AA1981.DAT:*
3: /SIDS1/gcgdata/hold-geneseg/genesegp-embl/AA1981.DAT:*
3: /SIDS1/gcgdata/hold-geneseg/genesegp-embl/AA1981.DAT:*
4: /SIDS1/gcgdata/hold-genesegy-embl/AA1981.DAT:*
5: /SIDS1/gcgdata/hold-genesegy-embl/AA1981.DAT:*
7: /SIDS1/gcgdata/hold-genesegy-embl/AA1981.DAT:*
8: /SIDS1/gcgdata/hold-genesegy-embl/AA1981.DAT:*
9: /SIDS1/gcgdata/hold-genesegy-embl/AA1980.DAT:*
10: /SIDS1/gcgdata/hold-genesegy-embl/AA1980.DAT:*
11: /SIDS1/gcgdata/hold-genesegy-embl/AA1990.DAT:*
12: /SIDS1/gcgdata/hold-genesegy-embl/AA1990.DAT:*
13: /SIDS1/gcgdata/hold-genesegy-embl/AA1990.DAT:*
14: /SIDS1/gcgdata/hold-genesegy-embl/AA1991.DAT:*
15: /SIDS1/gcgdata/hold-genesegy-embl/AA1991.DAT:*
16: /SIDS1/gcgdata/hold-genesegy-embl/AA1991.DAT:*
17: /SIDS1/gcgdata/hold-genesegy-embl/AA1991.DAT:*
18: /SIDS1/gcgdata/hold-genesegy-embl/AA1991.DAT:*
18: /SIDS1/gcgdata/hold-genesegy-embl/AA1991.DAT:*
19: /SIDS1/gcgdata/hold-genesegy-embl/AA1999.DAT:*
19: /SIDS1/gcgdata/hold-genesegy-embl/AA1999.DAT:*
19: /SIDS1/gcgdata/hold-genesegy-embl/AA1999.DAT:*
20: /SIDS1/gcgdata/hold-genesegy-embl/AA1999.DAT:*
21: /SIDS1/gcgdata/hold-genesegy-embl/AA1999.DAT:*
22: /SIDS1/gcgdata/hold-genesegy-embl/AA1999.DAT:*
22: /SIDS1/gcgdata/hold-genesegy-embl/AA2000.DAT:* 10: 111: 112: 113: 114: 115: 116: 116: 119: 119: 119: 120:

Pred. No. is the number of results predicted by chance to have a score greater than or equal to the score of the result being printed and is derived by analysis of the total score distribution.

		di			SUMMARIES	
Result No.	Score	Query Match	l Query Match Length DB ID	DB	ID	Description
1	2954	100.0	556	17	AAR92755	Trehalose-releasin
2	2954	100.0	556	17	AAR90620	Sulfolobus acidoca
М	1748.5	59.2	559	17	AAR90619	Sulfolobus solfata
4	1042.5	35.3	595	22	AAG92072	C glutamicum prote
S	1042.5	35,3	610	22	AAB80206	Corvnebacterium gl
9	696	32.8	589	16	AAR80289	Trehalose releasin
7	696	32.8	296	16	AAR77470	Trehalose releasin
8	959	32.5	598	16	AAR77471	Trehalose releasin
σ	928	32.4	597	16	AAR80290	Trehalose releasin
10	936	31.7	575	21	AAY85157	Trehalose-releasin
11	936	31.7	575	21	AAY85165	Trehalose-releasin

Bacillus stearot Starch-branching Heat-resistant B.stearothermoph C.glutamicum pro C.grutamicum pro C.grutamicum pro C.grutamicum pro C.grutamicum arzit Thermotoga marit Thermo	rme. tener. 33909. Sulfolobus acidocaldarius, - saccharide at temps. exceeding
AARB0037 AARB0109 AAR12711 AAC91100 AAB179423 AAR94423 AAW49871 AAW49871 AAW900069 AAX91209 AAX91209 AAX91209 AAX91209 AAX91209 AAX91209 AAX91209 AAX91304 AAX717523 AAB69074 AAX717523 AAM73553 AAW09257 AAW09257 AAW09257 AAW09257 AAW09257 AAW09257 AAW09277 AAE05726 AAW09277 AAE05726 AAW090977 AAE05726 AAW090977 AAE05726 AAW090977	AA. e enzy sweet n ATCC fto T;
552 552 553 553 554 555 555 555 555 555	in; y) most halo s st 760. 131. 128. UTSU Sug
	; P ng me; ald ald ald umi umi trad
25.5	QQ
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	55 AR9275 AR9275 3-AUG- rehalo hermos ulfolo U95271 1-FEB- 1-JUL- 1-JUL- 1-JUL- 1-JUL- 1-JUL- 1-JUL- 1-JUL- 1-JUL- 1-JUL- 1-JUL- 1-JUL- 1-JUL- 1-JUL- 1-JUL- 1-JUL- 1-APR- HAYB)
11111111122222222222222222222222222222	RESULT AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217 AAR9217

```
q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               d
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     οp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             QΥ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     á
                                                                                                                                                                             ö
                                                                                                                                                                                                                                                                                                                                                                                              360
                                                                                                                                                                                                                                                                                                                                                                                                                                                                           480
                                                                                                                                                                                                                                                61 IEDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFK 120
                                                                                                                                                                                                                                                                            GVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVONTYGGPWELAKLVNEAHK 180
                                                                                                                                                                                                                                                                                                                                                        WFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIVKDDCGYK 300
                                                                                                                                                                                                                                                                                                                                                                          241 wfktfkidglrldavhaifdnspkhilgeiaekahqlgkfviaesdlndpkivkddcgyk 300
                                                                                                                                                                                                                                                                                                                                                                                                                                    GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYYE 420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                NIRKRYNNCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGIGFPKKLKK 540
                         A thermostable enzyme (AAR92755) of Sulfolobus acidocaldarius ATCC 33909 releases trehalose from non-reducing saccharides having a trehalose structure as an end unit and a degree of polymerisation of at least 3. It has a mol.wt. of 54.64 kps (SDS-PAGE), a pl of 5.6-6.6 and is substantially not inactivated when incubated in acolution (pH 7.0) at 85 deg for 60 min. Recombinant enzyme is obtd. by expression of an isolated DNA fragment (AAT16899) in host cells, pref. Escherichia coli, using e.g. vector pBluescript II SK(+). The trehelose is useful as a sweetener.
                                                                                                                                                                              Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    transferase; amylase; Sulfolobus; production; alpha, alpha-trehalose; malto-oligosaccharide; hydrolysis.
                                                                                                                                                                                                           1 MFSFGGNIEKNKGIFKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYI 60
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Sulfolobus acidocaldarius amylase for alpha, alpha-trehalose prodn.
                                                                                                                                                                                                                                                                                                                             IDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          RGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          TNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYKQLI
                                                                                                                                                                             ó;
                                                                                                                                                           Length
                                                                                                                                                                             0; Indels
                                                                                                                                                          Score 2954; DB 17;
Pred. No. 7.5e-267;
                                                                                                                                                                              ·Mismatches
          Page 53-54; 74pp; English.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         256
                                                                                                                                                                            ö
                                                                                                                                                          100.0%;
100.0%;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       AAR90620 standard; Protein;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      DELIKVNRGVGVYQLE 556
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Best_Local Similarity 100.
Matches 556; Conservative
                                                                                                                              ¥
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               29-JUN-1996
         Claim 2;
                                                                                                                              Sequence
                                                                                                                                                           Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          AAR90620;
                                                                                                                                                                                                                                                                                                                                    181
                                                                                                                                                                                                                                                                           121
                                                                                                                                                                                                                                                                                                                  181
                                                                                                                                                                                                                                                                                              121
                                                                                                                                                                                                                                                                                                                                                        241
                                                                                                                                                                                                                                                                                                                                                                                             301
                                                                                                                                                                                                                                                                                                                                                                                                               301
                                                                                                                                                                                                                                                                                                                                                                                                                                    361
                                                                                                                                                                                                                                                                                                                                                                                                                                                      361
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                481
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     541
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                       8
                                                                                                                                                                                                                                                                           à
                                                                                                                                                                                                                                                                                            οp
                                                                                                                                                                                                                                                                                                                 å
                                                                                                                                                                                                                                                                                                                                q
                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                        Dp
                                                                                                                                                                                                                                                                                                                                                                                           δ
                                                                                                                                                                                                                                                                                                                                                                                                            q
                                                                                                                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                      Op
                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
```

```
The amylase is derived from Sulfolobus acidocaldarius. The amylase acts on a saccharide having at least three sugar units, which are prefigurose units at the reducing end (the linkage between the first and second glucose units is alpha-1, alpha-1, while the linkage between the second and third glucose units is alpha-1, while the linkage between the second and third glucose units is alpha-1, while the linkage between the linkages within the sugar chain, yielding alpha, alpha-trehalose and also mono- and disaccharide hydrolysis products. The amylase has a mol. wt. of 61 to 64 kba. It is characterised by working at pH 4.5-5.5 and at 60-85 deg.C. It has an isoelectric point of 4.3-5.4 and retains at least 100 percent activity after 6 hrs. at 80 deg.C. It is completely inhibited by 5 mM copper sulphate. Use of a transferase and the amylase in succession on suitable substrates such a malto-oligosaccharides, is useful for the production of alpha, alpha-trehalose.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYYE 420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      IEDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFK 120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 WFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIVKDDCGYK 300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Sulfolobus spp. derived transferase and amylase - for production of
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    CVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             MFSFGGNIEKNKGIFKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   RGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            IDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ;
0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Length 556;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                alpha, alpha-trehalose from malto-oligosaccharide(s)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         100.0%; Score 2954; DB 17; 100.0%; Pred. No. 7.5e-267;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Claim 112; Page 244-250; 357pp; Japanese.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ,
,
                                                                                                                                                                                        95JP-0120673.
94JP-0133354.
94JP-0194223.
94JP-0290394.
94JP-0386917.
                                                                                                                                             95WO-JP01189
acidocaldarius
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Conservative
                                                                                                                                                                                                                                                                                                                                                                   BEER KK
                                                                                                                                                                                                                                                                                                                                                                                                                WPI; 1996-049671/05.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                          N-PSDB; AAT12326
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   556
                                                                                                                                                                                                                                                                                                                                                                (KIRI ) KIRIN
                                                                                                                                             14-JUN-1995;
                                                                                                                                                                                                                                                                                                                   21-NOV-1994;
                                             WO9534642-A.
                                                                                                                                                                                                                   15-JUN-1994;
                                                                                                                                                                                                                                                                 31-OCT-1994
21-NOV-1994
                                                                                             21-DEC-1995
                                                                                                                                                                                               21-APR-1995
                                                                                                                                                                                                                                               18-AUG-1994
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Best Local Sim
Matches 556;
Sulfolobus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Query Match
Best Local 8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              361
```

ö

61 61 299

301

241 241 419

421

479 481 536 541

Ή;

 $\boldsymbol{\varepsilon}$

481

ŏ 셤 ò qq

ò g

```
300 KIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAP 359
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    :| |: |: || ||||| ||||| || || || ||::::||| : :::: | ||::
tfaykidgneviftlwapyqksvklkvlekglyemerdekgyftitlnnvkvrdrykyvl
                                                                               EDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFKG
                                                                                                                                            122 VIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKR
                                                                                                                                                                                                               182 GIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYW
                                                                                                                                                                                                                                                                               FKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIV--KDDCGY
                                                                                                                                                                                                                                                                                                VGDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ETNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYKQL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 INIRKRYN-NCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGI--GFPK
                 SFGGNIEKNKGIFKLWAPYVNSVKLK-LSKKLIPMEKNDEGFFEVEIDDIEENLTYSYII
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Yokoi
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Coryneform bacterium; amino acid synthesis; vitamin; saccharide;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Ochiai K,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    H, Ando S, Hayashi M,
Ikeda M, Ozaki A;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  5826
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  C glutamicum protein fragment SEQ ID NO:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Ŕ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  595
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Protein;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   (KYOW ) KYOWA HAKKO KOGYO KK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 2000JP-0159162
2000JP-0280988
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   18-DEC-2000; 2000EP-0127688
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    99JP-0377484
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Corynebacterium glutamicum.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 (first entry
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  KLKKDELIKVNRGVGVYQL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ::: : ::| :|:|
542 hieegk-yefdkgfalykl
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Mizoguchi H
Senoh A,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  organic acid synthesis.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    WPI; 2001-376931/40
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  standard;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   07-APR-2000;
03-AUG-2000;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  EP1108790-A2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    .6-DEC-1999;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 36-SEP-2001
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      s'z
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Nakagawa
Tateishi
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                AAG92072
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 AAG92072;
                                                                                                                                                                                                                                                                               242
                                                                                                                                                                                                                                                                                                                                                                                                                360
                                                                                                                                                                                                                                                                                                                                                                                                                                                 362
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 480
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 482
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  AAG92072
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 RESULT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               q
                                                                                                     QQ
                                                                                                                                            δ
                                                                                                                                                                           g
                                                                                                                                                                                                       οy
                                                                                                                                                                                                                                      Q
                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                        δy
                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                           9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
               ζ
                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    5;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             The amylase is derived from Sulfolobus solfataricus. The amylase acts on a saccharide having at least three sugar units, which are prefigurose units at the reducing end (the linkage between the first and second glucose units is alpha-1, alpha-1, while the linkage between the second and third glucose units is alpha-1, 4), to hydrolyse alpha-1, 4 linkages within the sugar chain, yielding alpha, alpha-trehalose and also mono- and disaccharide hydrolysis products. The amylase has a mol. wt. of 61 to 64 kDa. It is characterised by working at pH 4.5-5.5 and at 60-85 deg.C. It has an isoelectric point of 4.3-5.4 and retains at least 100 percent activity after 6 hrs. at 80 deg.C. It is completely inhibited by 5 mw copper sulphate. Use of a transferase and the amylase in succession on suitable substrates such a malto-oligosaccharides, is useful for the production of alpha, alpha-trehalose.
                                                                                                               361 gdlpprkfvvfignhdqvgnrgngerlsiltdkttylmaatlyilspyiplifmgeeyye 420
                                                                                                                                                                                                                                                                                                                                                                                                                transferase; amylase; Sulfolobus; production; alpha, alpha-trehalose;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                production of
                              NIRKRYNNCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGIGFPKKLKK
                                                                                                                                                                                                                                                                                                                                                                               Sulfolobus solfataricus amylase for alpha, alpha-trehalose prodn.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    7;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Length 559;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Query Match 59.2%; Score 1748.5; DB 17; Lengt Best Local Similarity 58.9%; Pred. No. 2.9e-154; Matches 329; Conservative 87; Mismatches 136; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 - for
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Sulfolobus spp. derived transferase and amylase - fo alpha, alpha-trehalose from malto-oligosaccharide(s)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Claim 108; Page 235-240; 357pp; Japanese
                                                                                                                                                                                                                                                                                 ¥
                                                                                                                                                                                                                                                                                                                                                                                                                                   malto-oligosaccharide; hydrolysis
                                                                                                                                                                                                                                                                               AAR90619 standard; Protein; 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             95JP-0120673.
94JP-0133354.
94JP-0290394.
94JP-0286917.
94JP-0311185.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  95WO-JP01189
                                                                                                                                                                                                                                                                                                                                                (first entry)
                                                                                                                                                                                DELIKVNRGVGVYQLE 556
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Sulfolobus solfataricus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 BEER KK.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               WPI; 1996-049671/05.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Ä
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  N-PSDB; AAT12325
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 (KIRI ) KIRIN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              31-OCT-1994;
21-NOV-1994;
21-NOV-1994;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                14-JUN-1995;
                                                                                                                                                                                                                                                                                                                                             29-JUN-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 W09534642-A
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 21-DEC-1995
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 21-APR-1995
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                15-JUN-1994
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                18-AUG-1994
                                                                                                                                                                                                                                                                                                              AAR90619;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Sequence
                                                                                                                               481
```

```
AAB80206 standard; Protein; 610 AA
                                                                                                                                                                       The present invention provides a number of nucleotide and protein sequences from the Coryneform bacterium Corynebacterium glutamicum. These are useful for identifying the mutation point of a gene derived from a mutant of coryneform bacterium, measuring expression amount and analysing the expression profile or expression pattern of a gene derived from coryneform bacterium, and identifying a homologue of a gene derived from coryneform bacterium, coryneform bacterium, coryneform bacterium, coryneform bacterium, and identifying a homologue of a gene derived from coryneform bacterium, coryneform bacteria are useful for producing amino acids, nucleic acids, vitemins, saccharides and organic acids, particularly L-lysine. The present sequence is a protein described hote: The sequence data for this patent did not form part of the printed specification, but was obtained in electronic format directly from the European Patent Office.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            13;
                                   Novel polynucleotides derived from Coryneform bacteria, for identifying mutation point of a gene, measuring expression of a gene, analysing expression profile or pattern of a gene and identifying homologous gene
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      300 KIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAP 359
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKTFKI 247
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                264
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DGLRLDAVHAIFDNSPKHILQEIAEKAHQLG-----KFVIAESDLNDPKIV--KDDCGY 299
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            360 VGD--LPPRKFVVFIQNHDQVGNRGNGERLS-ILTDKTTYLMAATLYILSPYIPLIFMGE 416
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             EYYETNPFFFFSDFSDPVLIKGVREGRLKE-----NNQMIDPQSEEAFLKSKLSWKID 469
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        470 EE---VLDYYKQLINIRKRYNNCK---RVKEVRREGNCITLIMEKIGIIASFDDIVINSK 523
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          YLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIAVIL 187
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ASRYOPLGVHDKSQLIRTDYQILD --- LGKVKIEDLIIYELHVGTFSQEGNFKGVIEKLD 127
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          199; Indels 35; Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          15 FKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYIIED----KREIPDP 70
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                dvvynhfgpdgnyngqfgpytsgg-stgwgdvvninghdsdevrnyildaarqwfedfhv
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  35.3%; Score 1042.5; DB 22; Length 595; 40.8%; Pred. No. 2.7e-88; ive 93; Mismatches 199; Indels 35;
                                                                                                                                      Claim 17; SEQ ID NO: 5826; 246pp + Sequence Listing; English.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Query Match 35.3
Best Local Similarity 40.8
Matches 225; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        524 ITGNLLIGIGFP 535
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              564 lggeliysftsp 575
                                                                                                                                                                                                                                                                                                                                                                                                                                                            595 AA
N-PSDB; AAH67291
                                                                                                                                                                                                                                                                                                                                                                                                                                                            Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       188
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     248
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          128
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              902
g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        õ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
```

RESULT AAB80206

```
fine chemical production; microorganism; organic acid; nucleoside; nonproteinogenic amino acid; purine base; pyrimidine base; nucleotide; lipid: saturated fatty acid; unasturated fatty acid; unasturated fatty acid; unasturated ratty acid; unimi; carbohydrate; aromatic compound; cofactor; polyketide; enzyme.
                                                                    Corynebacterium glutamicum; metabolic pathway protein; MP protein;
                                                   Corynebacterium glutamicum MP protein sequence SEQ ID NO:1146.
                                                                                                                                                                                                                                                           99DE-1031424
99DE-1031428
99DE-1031434
99DE-1031443
99DE-1031453
99DE-1031455
99DE-1031465
99DE-1031465
99DE-1031510
99DE-1031510
99DE-1031573
99DE-1031573
99DE-1031573
99DE-1031532
99DE-1031634
99DE-1031636
99DE-1031636
99DE-103128
99DE-103128
99DE-103128
99DE-103128
99DE-103128
99DE-103128
                                                                                                                                                                                                                        99DE-1031415.
99DE-1031418.
99DE-1031419.
99DE-1031420.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             99DE-1032230.
99DE-1032922.
99DE-1032926.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       99DE-1041380.
99DE-1041394.
99DE-1041396.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                99DE-1033004.
99DE-1033005.
99DE-1033006.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          99US-0148613.
99DE-1040764.
99DE-1040765.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 99DE-1042076.
99DE-1042077.
99DE-1042079.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      99DE-1041378.
                                                                                                                                                                              2000WO-IB00923
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       99DE-1032928
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     99DE-1040766
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               99DE-1040832
                                                                                                                                                                                                                 99US-0142101
                                                                                                                         Corynebacterium glutamicum
                                  (first entry)
                                                                                                                                          WO200100843-A2
                                                                                                                                                                              23-JUN-2000;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             09-JUL-1999;
14-JUL-1999;
14-JUL-1999;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 03-SEP-1999;
03-SEP-1999;
03-SEP-1999;
                                 30-APR-2001
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     27-AUG-1999;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      31-AUG-1999;
31-AUG-1999;
                                                                                                                                                            04-JAN-2001
                AAB80206;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               27-AUG-1
```

```
524 ITGNLLIGIGFP 535
                         579 lggeliysftsp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                N-PSDB; AAQ98669
                                                                                                                                                                                                                                                        pharmaceuticals.
                                                                                                                                                                                                                                                                                                                                                              J7-MAR-1995;
                                                                                                                                                                                                                                                                                                                                                                                        37-MAR-1994;
                                                                                                                                                                                                                                                                                                                                                                                                      J7-MAR-1994;
                                                                                                                                               19-JAN-1996
                                                                                                                                                                                                                                                                                                       EP671470-A2
                                                                                                                                                                                                                                                                                                                                   13-SEP-1995
                                                                                                                                                                                                                                                                                                                                                                                                                                                         Hattori K,
                                                                                        AAR80289
                                                                                                                    AAR80289
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  end unit.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Query Match
                                                                 9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Best Loca
Matches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         89
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   116
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    œ
                                                                                                                   ò
                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ğ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    13;
                                                                                                                                                                                                                                                                                          F71753 to AAF72330 encode the Corynebacterium glutamicum metabolic thway (MP) proteins given in AAB79634 to AAB80211. The C. glutamicum nucleic acids are useful for the production of fine chemicals
                                                                                                                                                                                                            pathway proteins, useful for producing fine chemicals in microorganisms, including organic acids, nonproteinogenic amino acids, and purine and pyrimidine bases -
                                                                                                                                                                                                                                                                                                                                in microorganisms, including organic acids, nonproteinogenic amino acids, purine and pyrimidine bases, uncleosides, nucleotides, lipids, saturated and unsaturated fatty acids, diols, carbohydrates, aromatic compounds, vitamins, cofactors, polyketides and enzymes.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          578
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                300 KIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAP 359
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         EYYETNPFFFFSDFSDPVLIKGVREGRLKE-----NNQMIDPQSEEAFLKSKLSWKID 469
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | :||| : | | |: :|| | : :|||
fsvwaplphdvhlilngetlpmhktegswwraeiap-kagdrygfslfdgsswsktlpdp 101
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 71 ASRYQPLGVHDKSQLIRTDYQILD---LGKVKIEDLIIYELHVGTFSQEGNFKGVIEKLD 127
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    35; Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            FKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYIIED ---- KREIPDP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      YLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIAVIL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKTFKI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        DGLRLDAVHAIFDNSPKHILQEIAEKAHQLG-----KFVIAESDLNDPKIV--KDDCGY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     VGD--LPPRKFVVFIONHDQVGNRGNGERLS-ILTDKTTYLMAATLYILSPYIPLIFMGE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                EE---VLDYYKQLINIRKRYNNCK---RVKEVRREGNCITLIMEKIGIIASFDDIVINSK
                                                                                                                                                                                                  encoding metabolic
                                                                                                                                 Ġ
                                                                                                                                                                                                                                                                                                                                                                                                                                             Length 610;
                                                                                                                                 Haberhauer
                                                                                                                                                                                                                                                                                                                                                                                                                                          35.3%; Score 1042.5; DB 22; Lengt
40.8%; Pred. No. 2.8e-88;
ive 93; Mismatches 199; Indels
                                                                                                                               Zelder O,
                                                                                                                                                                                                  Corynebacterium glutamicum
                                                                                                                                                                                                                                                                Claim 20; Page 1722-1725; 1737pp; English.
                                                                                                                               Schroeder H,
                                  99DE-1042095.
99DE-1042124.
99DE-1042129.
2000US-0187970.
           99DE-1042087
                                                                                                                                                                                                                                                                                                                                                                                                                                       Query Match 35.3%
Best Local Similarity 40.8%
Matches 225; Conservative
                                                                                                                               Kroeger B,
                                                                                                                                                       2001-137957/14
                                                                                                                                                                                                 Nucleic acids from
                                                                                                                                                                                                                                                                                                                                                                                                   610 AA;
                                                                                                                                                        WPI; 2001-137957
N-PSDB; AAF72325
                                                                                                     AG
                                                              03-SEP-1999;
09-MAR-2000;
                                                                                                     (BADI ) BASF
                                    03-SEP-1999;
03-SEP-1999;
                                                                                                                               Pompejus M,
                         03-SEP-1999
                                                                                                                                                                                                                                                                                                                                                                                                    Sequence
                                                                                                                                                                                                                                                                                                         pathway
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        43
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    128
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         417
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               15
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        188
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 221
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            248
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     360
```

 g

0 0 0 0 0 g

o o o o

```
12;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    This enzyme can be used for the preparation of trehalose with high yields and efficiency from non-reducing saccharides such as alpha-glucosyltrehalose, alpha-maltotirepsyltrehalose, alpha-maltoterasyltrehalose and maltopentaosyltrehalose. The trehalose can be used as sweetener, taste-improving agent, quality-improving agent, stabiliser, filler, exciplent or adjuvant in food products cosmetics and pharmaceuticals.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  66 EIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDL------IIYELHVGTFSQ 115
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  plpdprtrrqpegvh---alsrt----fdpgahrwqdagwqgrelqgsviyelhigtftp 120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   176 NEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFIL 235
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  DNA encoding a trehalose releasing enzyme – which releases trehalose from a non-reducing saccharide having a trehalose structure as an
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    65
                                                                                                                                                                                                                                         trehalose; alpha-glucosyltrehalose; alpha-maltosyltrehalose;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    13 GIFKLWAPYVNSVKLKLSKKLIPMEKN-----DEGFFEVEIDDIEENLTYSYIIE-DKR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               grfdiwapeagtvtllaggeryemgrrpgngpadegwwtaadaptgadvdygylldgdei
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                EGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLV
                                                                                                                                                                                                                                                                  alpha-maltotriosyltrehalose; alpha-maltotetrasyltrehalose;
maltopentaosyltrehalose; sweetener; taste-improving agent;
stabiliser; filler; excipient; adjuvant; foodstuffs; cosmetics;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        60;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Length 589;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     195;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             DB 16;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            2e-81;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Tsusaki
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          32.8%; Score 969; 39.5%; Pred. No. 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        (HAYB ) HAYASHIBARA SEIBUTSU KAGAKU.
   Ž
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Sugimoto T,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Claim 3; Page 21-22; 45pp; English.
589
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     74;
standard; Protein;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     95EP-0301474
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                94JP-0059840
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            94JP-0059834
                                                                                                                                                                           Trehalose releasing enzyme
                                                                                                                      (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Kubota M,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           WPI; 1995-312772/41
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Local Similarity
les 215; Conser
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      AA;
                                                                                                                                                                                                                                                                                                                                                                                                                       Rhizobium sp. M11
```

12;

```
SS \times S
                                                                                            ò
                                                                                                               g
                                                                                                                                                 QQ
                                                                                                                                                                                     g
                                                                                                                                                                                                         Qγ
                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                              δy
                                                                                                                                                                                                                                                            Dp
                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                 οy
                                                                                                                                                                                                                                                                                                                      οy
                                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                             Ω
                                                                                                                                                                                                                                                                                                                                                                                                                Q
                                                                                                                                                                                                                                                                                                                                                                                                                                    ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
ENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGK-----FVIAESDLND 289
                                    290 PKIV--KDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGK 347
                                                                                                     348 YSRYRGRTHGAPV--GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                         SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEA 458
                                                                                                                                                                             FLKSKLSWK-----IDEEVLDYYKQLINIRKRYNNCKRVKEVRREGNCITLIMEKIGIIA 513
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    DNA encoding a trehalose releasing enzyme - which releases trehalose from a non-reducing saccharide having a trehalose structure as an
                                                                                                                                                                                                                                                                                                                                                         Enzyme; trehalose; alpha-glucosyltrehalose; alpha-maltosyltrehalose; alpha-maltotriosyltrehalose; alpha-maltoterrasyltrehalose; maltopentaosyltrehalose; sweetener; taste-improving agent; stabiliser; filler; excipient; adjuvant; foodstuffs; cosmetics;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          This enzyme can be used for the preparation of trehalose with high yields and efficiency from non-reducing saccharides such as alpha-glucosyltrehalose, alpha-maltosyltrehalose, alpha-maltotriosyltrehalose, and maltopentaosyltrehalose. The trehalose can be used as a sweetener,
                                                                                                                                                                                        Tsusaki
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     (HAYB ) HAYASHIBARA SEIBUTSU KAGAKU
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Claim 3; Page 27-29; 45pp; English.
                                                                                                                                                                                                                                                                                AAR77470 standard; Protein; 596 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Sugimoto T,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          94JP-0059840.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   94JP-0059834.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       95EP-0301474
                                                                                                                                                                                                                                                                                                                                          enzyme
                                                                                                                                                                                                                                                                                                                      (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Kubota M,
                                                                                                                                                                                                                                                                                                                                        Trehalose releasing
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        WPI; 1995-312772/41
                                                                                                                                                                                                                                                                                                                                                                                                                 Rhizobium sp. M11.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  N-PSDB; AAQ98671.
                                                                                                                                                                                                                                                                                                                                                                                               pharmaceuticals.
                                                                                                                                                                                                                 514 SFDD 517
                                                                                                                                                                                                                                  efdd 530
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       07-MAR-1995;
                                                                                                                                                                                                                                                                                                                      25-JAN-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          J7-MAR-1994;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   07-MAR-1994;
                                                                                                                                                                                                                                                                                                                                                                                                                                  EP671470-A2.
                                                                                                                                                                                                                                                                                                                                                                                                                                                     13-SEP-1995
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Hattori K,
                                                                                                                                                                                                                                                                                                   AAR77470;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       end unit.
                          236
                                                                                  301
                                                                                                                                         406
                                                                                                                                                                             459
                                                                                                                                                                                                                                   527
                                                                                                                                                                                                                                                                RESULT
AAR77470
                                                                                                                                                                                                                                                                                                  ò
                                                                                a
                                                                                                    ò
                                                                                                                   q
                                                                                                                                                          a
                                                                                                                                                                                            q
                                                                                                                                        ò
                                                                                                                                                                           ò
                                                                                                                                                                                                                ò
```

```
EIPDDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDL------IIYELHVGTFSQ 115
                                                                                                                                                                                                                                                                                                                                                                   116 EGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLV 175
                                                                                                                                                                                                                                                                                                                                                                                                                                                               NEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFIL 235
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGK-----FVIAESDLND 289
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      PKIV--KDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGK 347
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |::: :| || : || |||||||| :: | || || : | :| || :|| prllyprdvngyglagqwsddfhhavhvnvsgettgyysdfdslgalakvlrdgffhdgs 367
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      YSRYRGRTHGAPV -- GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEA 458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                FLKSKLSWK-----IDEEVLDYYKQLINIRKRYNNCKRVKEVRREGNCITLIMEKIGIIA 513
taste-improving agent, quality-improving agent, stabiliser, filler, excipient or adjuvant in food products cosmetics and pharmaceuticals.
                                                                                                                                                                                                                                        13 GIFKLWAPYVNSVKLKLSKKLIPMEKN-----DEGFFEVEIDDIEENLTYSYIIE-DKR 65
                                                                                                                                                                                                                                                                                        grfdiwapeagtvtllaggeryemgrrpgngpadegwwtaadaptgadvdygylldgdei 74
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Enzyme; trehalose; alpha-glucosyltrehalose; alpha-maltosyltrehalose; alpha-maltotriosyltrehalose; alpha-maltoterrasyltrehalose; maltopentaosyltrehalose; sweetener; taste-improving agent; stabiliser; filler; excipient; adjuvant; foodstuffs; cosmetics;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             32.8%; Score 969; DB 16; 39.5%; Pred. No. 2e-81;
                                                                                                                                                                                      74; Mismatches 195;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   AAR77471 standard; Protein; 598
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Trehalose releasing enzyme.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (first entry)
                                                                                                                                                                                         Matches 215; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Arthrobacter sp. 036
                                                                                                                                                                  Similarity
                                                                   AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              514 SFDD 517
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           534 efdd 537
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               25-JAN-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        EP671470-A2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       13-SEP-1995
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  AAR77471;
                                                                      Sequence
                                                                                                                                            Query Match
                                                                                                                                                                     Best Local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      œ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             188
                                                                                                                                                                                                                                                                                                                                       99
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              176
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         290
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         308
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      348
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     368
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     406
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 459
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 488
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            AAR77471
```

```
trehalose; alpha-glucosyltrehalose; alpha-maltosyltrehalose;
                                                                                                        maltopentaosyltrehalose; sweetener; taste-improving agent;
stabiliser; filler; excipient; adjuvant; foodstuffs; cosmetics;
                                                                                                                                                                                                                                                                                                                                                                       coding a trehalose releasing enzyme – which releases treh non-reducing saccharide having a trehalose structure as
                                                                                              alpha-maltotriosyltrehalose; alpha-maltotetrasyltrehalose;
                                                                                                                                                                                                                                                                                      (HAYB ) HAYASHIBARA SEIBUTSU
                                                                                                                                                                                                                                                    94JP-0059840
94JP-0059834
                                                                                                                                                                                                                             95EP-0301474
                                                           Trehalose releasing enzyme.
                                                                                                                                                                                                                                                                                                              Hattori K, Kubota M,
                                                                                                                                                        Arthrobacter sp. 036.
                                                                                                                                                                                                                                                                                                                                    WPI; 1995-312772/41
                                                                                                                                                                                                                                                                                                                                                N-PSDB; AAQ98670
                                                                                                                                 pharmaceuticals.
                                                                                                                                                                                                                                                               07-MAR-1994;
                                                                                                                                                                                                                                                                                                                                                                       encoding
                                                                                                                                                                                                                            07-MAR-1995;
                                                                                                                                                                                                                                                    07-MAR-1994;
                                   19-JAN-1996
                                                                                                                                                                             EP671470-A2
                                                                                                                                                                                                     13-SEP-1995
             AAR80290;
                                                                                                                                                                                                                                                                                                                                                                                               end unit,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Query Match
                                                                                                                                                                                                                                                                                                                                                                                    rom a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     89
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Matches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        197
   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                òγ
                                                                                                                                                                                                                                                                                                                                                                      10;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      243
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     244 TFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFV-----IAESDLNDPKIV--KD 295
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             MGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEAFLKSKLSW 466
                                                                                                                                                                                                             This enzyme can be used for the preparation of trehalose with high yields and efficiency from non-reducing saccharides such as alpha-glucosyltrehalose, alpha-maltotriosyltrehalose, alpha-maltotriosyltrehalose. The transitoterasyltrehalose and maltopentaosyltrehalose. The trehalose can be used as a sweetener, taste-improving agent, quality-improving agent, stabiliser, filler, excipient or adjuvant in food products cosmetics and pharmaceuticals.
                                                                                                                                                                                                                                                                                                                                                                                                                                         PDPASRYQPLGVHDKSQLI-RTDYQILD---LGKVKIEDLIIYELHVGTFSQEGNFKGVI 123
                                                                                                                                                                                                                                                                                                                                                                                                                                                        gviqdvvynhlgpsgnylprfgpylkggegntwgdsvnldgpgsdhvrryildnlamwlr 257
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            317
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   DCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRT 355
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               HGAPV--GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIF 413
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               coding a trehalose releasing enzyme – which releases trehalose non-reducing saccharide having a trehalose structure as an
                                                                                                                                                                                                                                                                                                                                                                                            67
                                                                                                                                                                                                                                                                                                                                                                                                                ydvwapnaesvtllaggeryamgrraetgpedagwwtaagaptdgnvdygylldgdetpl
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  FKLWAPYVNSVKLKLSKKLIPMEK -----NDEGFFEVEIDDIEENLTYSYIIE-DKREI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      124 EKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      AVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFK
                                                                                                                                                                                                                                                                                                                                              Length 598;
                                                                                                                                                                                                                                                                                                                                                                      Indels
                                                                                                                                                                                                                                                                                                                                            32.5%; Score 959; DB 16;
llarity 40.2%; Pred. No. 1.7e-80;
Conservative 81; Mismatches 186;
                                                                                 Sugimoto T, Tsusaki K;
                                                         (HAYB ) HAYASHIBARA SEIBUTSU KAGAKU.
                                                                                                                                                                                      Claim 6; Page 27-29; 45pp; English
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             KIDEE-----VLDYYKQLINIRK 484
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         498 aeaaegdharllelyrsltalrr
 95EP-0301474
                       94JP-0059840
                                  94JP-0059834
                                                                                Kubota M,
                                                                                                       WPI; 1995-312772/41.
                                                                                                                                                                                                                                                                                                                                                       Local Similarity
nes 202; Conserv
                                                                                                                                                                                                                                                                                                            598 AA;
                                                                                                                   N-PSDB; AAQ98672
                                                                                                                                           encoding
07-MAR-1995;
                                 07-MAR-1994;
                      07-MAR-1994
                                                                                Hattori K,
                                                                                                                                                                                                                                                                                                                                              Query Match
Best Local 5
                                                                                                                                                                  end unit
                                                                                                                                                                                                                                                                                                            Sequence
                                                                                                                                                      from a
                                                                                                                                                                                                                                                                                                                                                                    Matches
                                                                                                                                                                                                                                                                                                                                                                                                                 19
                                                                                                                                                                                                                                                                                                                                                                                                                                         68
                                                                                                                                                                                                                                                                                                                                                                                            12
                                                                                                                                                                                                                                                                                                                                                                                                                                                                79
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               356
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       378
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              414
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            467
                                                                                                                                           DNA
g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    q
                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                               엄
                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                δý
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
```

trehalose

Tsusaki

Sugimoto T,

```
10;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   184 AVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFK 243
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     244 TFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFV-----IAESDLNDPKIV--KD 295
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              296 DCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRT 355
                                               This enzyme can be used for the preparation of trehalose with high yields and efficiency from non-reducing saccharides such as alpha-glucosyltrehalose, alpha-maltosyltrehalose, alpha-maltotetrasyltrehalose and maltopentaosyltrehalose. The trehalose can be used as a sweetener, taste-improving agent, guality-improving agent, stabiliser, filler, excipient or adjuvant in food products cosmetics and pharmaceuticals.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 PDPASRYQPLGVHDKSQLI-RTDYQILD---LGKVKIEDLIIYELHVGTFSQEGNFKGVI 123
                                                                                                                                                                                                                                                                                                                                                                                                         Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                        67
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          18 ydvwapnaesvtllaggeryamgrraetgpedagwwtaagaptdgnvdygylldgdetpl 77
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                FKLWAPYVNSVKLKLSKKLIPMEK - - - - - NDEGFFEVEIDDIEENLTYSYIIE-DKREI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     124 EKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      34;
                                                                                                                                                                                                                                                                                                                                            Length 597;
                                                                                                                                                                                                                                                                                                                                                                                                   Indels
                                                                                                                                                                                                                                                                                                                                            ; Score 958; DB 16;
; Pred. No. 2.1e-80;
81; Mismatches 186;
Claim 3; Page 24-25; 45pp; English.
                                                                                                                                                                                                                                                                                                                                                 32.48;
40.28;
                                                                                                                                                                                                                                                                                                                                                                        Local Similarity 40.2 nes 202; Conservative
                                                                                                                                                                                                                                                                    597 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ŏ
```

AAR80290 standard; Protein; 597 AA.

AAR80290 ID AAR8

RESULT

œ

```
8 X C C C
                                                                                                                                                                           Ω
                                                                                                                                                                                                    ò
                                                                                                                                                                                                                             pp
                                                                                                                                                                                                                                                                                 Dp
                                                                                                                                                   á
                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                             QΫ́
                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                      δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                В
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                           δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    from Arthrobacter sp. 334. This energy engrging engine and the sequence from Arthrobacter sp. 334. This energy engrging engine as an end unit. The invention relates to this enzyme and also to a non-reducing saccharide having a trehalose structure as an end unit. The invention relates to this enzyme and also to a non-reducing accharide having a trehalose forming enzyme that forms a non-reducing partial starch hydrolysates. The two moles of glucose bound at their reducing residues. The disaccharide consisting of two moles of glucose bound at their reducing residues. The disaccharide abilities. The enzymes are used to produce non-reducing sugars, they are particularly used for further enzymatic conversion of starch hydrolysate to trehalose. The non-reducing sugars produced by the enzymes are useful in foods, pharmaceuticals and cosmetics. Non-reducing sugars are compatible with anino acids and proteins, they do not cause browning, and new good moisture-retaining properties. The enzymes produce the non-reducing sugars in high yield and function at a medium temperature range 1.e. between 40 degrees celains and 60 degrees celaius, and in an caldic pH range, 1.e. a pH of less than 7. Production of non-reducing
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             This sequence represents a trehalose-releasing enzyme amino acid sequence
Non-reducing saccharide-forming enzyme; trehalose; disaccharide; food;
high yield; trehalose releasing enzyme; moisture retention; cosmetic;
                                                      MGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM -----IDPQSEEAFLKSKLSW 466
                                       HGAPV -- GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIF 413
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            New mesophilic enzyme from Arthrobacter, used to convert starch hydrolysate into non-reducing sugars, particularly trehalose, useful a sweetener in foods, pharmaceuticals and cosmetics -
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Miyake T;
                                                                                                                                                                                                                                                                                                                        Trehalose-releasing enzyme amino acid sequence.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Kubota M, Fukuda S,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Claim 29; Page 47-48; 93pp; English.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    (HAYB ) HAYASHIBARA SEIBUTSU KAGAKU.
                                                                                                                                                                                                                                          AAY85157 standard; protein; 575 AA
                                                                                                                                                                497 aeaaegdharllelyrsltalrr 519
                                                                                                                                               467 KIDEE-----VLDYYKQLİNIRK 484
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      99EP-0307220.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               98JP-0258394.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           99JP-0016931
                                                                                                                                                                                                                                                                                              (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                      Arthrobacter sp. S34.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       WPI; 2000-273225/24.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Maruta
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    N-PSDB; AAA10503.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      13-SEP-1999;
                                                                                                                                                                                                                                                                                              23-JUN-2000
                                                                                                                                                                                                                                                                                                                                                               high yield; 
production.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                11-SEP-1998;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         26-JAN-1999;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Yamamoto T,
                                                                                                                                                                                                                                                                                                                                                                                                                                 EP990704 - R2
                                                                                                                                                                                                                                                                                                                                                                                                                                                           05-APR-2000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              11-DEC-1998
                                                                                                                                                                                                                                                                    AAY85157;
                                                                                                                                                                                                               RESULT 10
                                                                                          414
            317
                                       356
                                                                377
                                                                                                                     437
                                                                                                                                                                                                                               AAY851
                                                                                                                                                                                                                                         셤
                                                                                                                                               ò
                                                                                                                                                                      g
            엄
                                       ò
                                                                엄
                                                                                          ð
```

```
10;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Non-reducing saccharide-forming enzyme; trehalose; disaccharide; food; high yield; trehalose releasing enzyme; moisture retention; cosmetic;
                                                                                                                                                                                                                                                                                                                                                                                                                      Gaps
                                                                                                                                                                                                                                                                                                                                                       65 rslrqprgvh-----elgrefdparyawgddgwrgrdltgaviyelhvgtft 111
                                                                                                                                                                                                                                                                                                                                                                                                QEGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKL 174
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   235 LENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIA----EKAHQLGK--FVIAESDLN 288
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DPKIVKDDC--GYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDG 346
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         347 KYSRYRGRTHGAPVG-DLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              406 SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEA 458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ------KIEDLIIYELHVGTFS 114
                                                                                                                                                                                                                               15 FKLWAPYVNSVKLKL--SKKLIPMEKNDEGFFEVE--IDDIEENLTYSYIIEDKREIPDP 70
                                                                                                                                                                                                                                                       | :||| | | : : :|: ::: |: :| || || 5 fpvwapqaaqytlvvgggraelpltrdengwwalqqpwdggpdlvdygylvdgkgpfadp
sugars using the enzymes eliminates the need to convert a starch hydrolysate into sugar alcohols (non-reducing) by catalytic
                                                                                                                                                                                        54;
                                                                                                                                               Length 575;
                                                                                                                                                                                        Indels
                                                                                                                                           31.7%; Score 936; DB 21;
38.7%; Pred. No. 2.3e-78;
ive 82; Mismatches 177;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              rehalose-releasing enzyme amino acid sequence.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | :| | | ; :| :| :| :| :| :| farshldwseperephagllafytdlialrr 502
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       459 FLKSKLSWKIDEE-----VLDYYKQLINIRK 484
                                                                                                                                                                                                                                                                                                              71 ASRYQPLGVHDKSQLIRTDYQILDLGKV-----
                                                                                                                                                                                  ,82;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    AAY85165 standard; Protein; 575
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   99EP-0307220
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          98JP-0258394
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            98JP-0352252.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    23-JUN-2000 (first entry)
                                                                                                                                                                  Best Local Similarity 30.79
Matches 198; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          S34.
                                                                                575 AA;
                                         hydrogenation.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        11-SEP-1998;
11-DEC-1998;
26-JAN-1999;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Arthrobacter
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 13-SEP-1999;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              EP990704-A2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          05-APR-2000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                production.
                                                                                  Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             AAY85165;
                                                                                                                                               Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             RESULT 11
                                                                                                                                                                                                                                                                                                                                                                                                115
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   583
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                472
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              AAY85165
```

```
412 gpftpmlfmgeewgartpwqfftshpepelgeatargriaefarmgwdpavvpdpqdpat 471
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               97 ----KVKIEDLIIYELHVGTF-SQEGNFKGVIEKLD----YLKDLGITGIELMPVAQFPG 147
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                206 PYF----SDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKTFKIDGLRLDAV---- 255
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      80 vpenleghlykyeivtpdggvlfkadpyafyselrphtas--iaydlkgygwndgswkrk 137
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    198 drswgyggtgyyavtsrygtphdfmyfvdrchqagigvimdwvpghfckdahglymfdga 257
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Thermostable branching enzyme gene and recombinant plasmid contg. it — used to produced a thermostable branching enzyme
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            A gene coding for a thermostable branching enzyme has been isolated from chromosomal DNA of B.stearothermophilus strain TRBE14 and sequenced (see AAT04542). The enzyme (AAR80037) was found to have an activity of 80% or more at up to 65 deg.C
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        26 fgahvineggkvgtrfcvwapharevrlvgsfndwdgtdfrlek-----vndegvwtiv 79
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 4 FGGNIEKNKG----IFKLWAPYVNSVKL------KLSKKLIPMEKNDEGFFEVE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        148 NRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIAVILDVVYNHI--GPEGNYLLGLG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         48 IDDIEENLTYSY-IIEDKREI---PDPASRYQPLGVHDKSQLIRTD---YQILDLG----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       186; Indels 162;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         /note= "Met residue corresponds to TTG codon'
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Length 652;
                                                                                                                                                                                                                                                                                                                                                                                  Thermostable; 1,4-alpha-glucan; branching enzyme; amylose;
                                                                                                                                                                                                                                                                                                                                     Bacillus stearothermophilus thermostable branching enzyme.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Score 360; DB 16;
Pred. No. 1.7e-24;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          12.2%; Sco. 25.3%; Pred. No. 1., 25.3%; 72; Mismatches 7
                                                                                                                                                                                                                                                                                                                                                                                                                                                   Bacillus stearothermophilus (strain TRBE14).
                                         459 FLKSKLSWKIDEE-----VLDYYKQLINIRK 484
                                                                        Location/Qualifiers
                                                                                                                                                                                                        Ą.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Claim 3; Page 6-12; 14pp; Japanese.
                                                                                                                                                                                                   AAR80037 standard; Protein; 652
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          93JP-0311004.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              93JP-0311004
                                                                                                                                                                                                                                                                                           (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       142; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                         transferase
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      (EZAK ) EZAKI GLICO CO.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                WPI; 1995-315926/41
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Query Match
Best Local Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       N-PSDB; AAT04542
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Misc-difference
                                                                                                                                                                                                                                                                                                                                                                                                         amylopectin;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   JP07213287-A
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              04-NOV-1993;
                                                                                                                                                                                                                                                                                           11-JUL-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       04-NOV-1993;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 15-AUG-1995
                                                                                                                                                                                                                                               AAR80037;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Sequence
                                                                                                                                                         RESULT 12
                                                                                      472
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Matches
                                                                                                                                                                              AAR80037
qq
                                         Qγ
                                                                                 g
                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           10;
                                                                                                                                                                                                                                                                                                                                 from Arthrobacter sp. S34. This enzyme specifically hydrolyses a nor-reducing saccharide having a trehalose structure as an end unit. The invention relates to this enzyme and also to a non-reducing saccharide forming enzyme that forms a non-reducing saccharide having a trehalose structure as an end unit by reducing partial starch hydrolysates. The two enzymes can be used to produce trehalose, a disaccharide consisting of two moles of glucose bound at their reducing residues. The disaccharide is substantially free of reducibility and has moisture retaining
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             abilities. The enzymes are used to produce non-reducing sugars, they are particularly used for further enzymatic conversion of starch hydrolysate to trehalose. The non-reducing sugars produced by the enzymes are useful in foods, pharmaceuticals and cosmetics. Non-reducing sugars are compatible with amino acids and proteins, they do not cause browning, and have good moisture-retaining properties. The enzymes produce the non-reducing sugars in high yield and function at a medium temperature
                                                                                                                                                                                                                                                                                                              This sequence represents a trehalose-releasing enzyme amino acid sequence
                                                                                                                                                                       New mesophilic enzyme from Arthrobacter, used to convert starch hydrolysate into non-reducing sugars, particularly trehalose, useful as a sweetener in foods, pharmaceuticals and cosmetics -
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       range i.e. between 40 degrees celsius and 60 degrees celsius, and in an acidic ph range, i.e. a pH of less than 7. Production of non-reducing sugars using the enzymes eliminates the need to convert a starch hydrolysate into sugar alcohols (non-reducing) by catalytic
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             71 ASRYQPLGVHDKSQLIRTDYQILDLGKV--------KIEDLIIYELHVGTFS 114
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 115 QEGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKL 174
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           175 VNEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFI 234
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               LENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIA----EKAHQLGK--FVIAESDLN 288
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DPKIVKDDC--GYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDG 346
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              347 KYSRYRGRTHGAPVG-DLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEA 458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     65 rslrqprgvh-----elgrefdparyawgddgwrgrdltgaviyelhvgtft 111
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 64
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     15 FKLWAPYVNSVKLKL--SKKLIPMEKNDEGFFEVE--IDDIEENLTYSYIIEDKREIPDP 70
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 54;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Length 575;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Indels
                                                                 Ξ,
                                                              Miyake
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            31.7%; Score 936; DB 21;
38.7%; Pred. No. 2.3e-78;
Live 82; Mismatches 177;
                                                              ŝ
                                                              Kubota M, Fukuda
                                                                                                                                                                                                                                                                Example 6-2; Page 56-58; 93pp; English.
                  (HAYB ) HAYASHIBARA SEIBUTSU KAGAKU
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Conservative
                                                              Maruta K,
                                                                                                        WPI; 2000-273225/24
N-PSDB; AAA10516.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Best Local Similarity
Matches 198; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                575 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    hydrogenation.
                                                              famamoto T,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         406
```

셤 ò g

ŏ

qq

ō Q οy

ò

셤

q

οy

셤

ò

δ

25;

Gaps 47

```
256 ----HAIFDNS-PKHILQEIAEK--AHQLGKFVIAESDLNDPKIVKD-----DCGYKID 302
                                                                             303 AQWVDDF------HHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYR 352
                                                                                                                                                                      410 PLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSW--- 466
                                                                                                 376 mgwmndmlkymetppyerrhvhnqvtfsllyays----enfilpfshdevvhgkks--- 427
                                                                                                                         GRTHGAPVGDLPPRKFVVFIQNHDQVGNRGNG---ERLSILTDKTTYLMAATLYILSPYI 409
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         New glucan with cyclic, branched core and outer branched region -useful in foods, drinks, adhesives, infusion compsns. etc., readily soluble in water forming solns. of low viscosity
                                                                                                                                                                                                                                                                                                                                                                                          Starch-branching-enzyme; thermostable; Q-enzyme; Escherichia coli; starch; amylopectin; glucan; cyclodextrin; food; food-additive; adhesive; biodegradable plastic.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ţ
                                                                                                                                                                                                                                                                                                                                                                                                                                        Bacillus stearothermophilus strain TRBE14 (FERM P-13916).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        "Conserved amylase sequence used construct primer AAT27127"
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      nsed
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Takaha T;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  /note="Conserved amylase sequence"
414..423
/note="Conserved amylase sequence"
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   /note= "Conserved amylase sequence
construct primer AAT27126"
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          'n
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Okada
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Example A-2; Page 28-31; 50pp; English.
                                                                                                                                                                                                                                                                                                                                                                                                                                                              Location/Qualifiers
                                                                                                                                                                                                                                                                                                    Ä
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Nakamura H,
Yanase M;
                                                                                                                                                                                                                    --KIDEEVLDYYKQLINIRKRY 486
                                                                                                                                                                                                                                :: :: || |:|| ||| 483 dfelhrkmndymkeliacykry 504
                                                                                                                                                                                                                                                                                                  AAR96109 standard; Protein; 652
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               95JP-0195647.
94JP-0218554.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         95EP-0250222
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  (EZAK ) EZAKI GLICO CO LTD.
                                                                                                                                                                                                                                                                                                                                               (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          309..317
                                                                                                                                                                                                                                                                                                                                                                     Starch-branching-enzyme.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Imanaka T,
Terada Y,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         WPI; 1996-223407/23.
N-PSDB; AAT27128.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         3-SEP-1995;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                31-JUL-1995;
13-SEP-1994;
                                                                                                                                                                                                                                                                                                                                               20-AUG-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   08-MAY-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             EP710674-A2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Fujii K,
Takata H,
                                                                                                                                                                                                                                                                                                                        AAR96109;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Peptide
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Peptide
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Peptide
                                                                                                                                                428
                                                                                                                                                                                                                   467
          g
                                                                                                                                                                                                                                                                                                              ð
                                                   q
                                                                           ö
                                                                                                Q
                                                                                                                     ò
                                                                                                                                           QΩ
                                                                                                                                                                      ò
                                                                                                                                                                                            g
                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                       g
```

```
25;
This sequence represents a thermostable starch- branching-enzyme (Q-enzyme, EC-2.4.1.8) from Bacillus stearchermophilus TRBE14 (FERM P-13916). Conserved regions present in amylases are used to construct primers AAT27126-7, which are used in PCR to amplify a fragment of the gene, which is then used as a probe to isolate a full-length clone in Escherichia coli. The recombinant enzyme may be reacted with starch or amylopectin to produce a glucan with a degree of polymerisation of at least 50, with an inner branched cyclic region and an outer branched region. The product is freely soluble in water, forming a low-viscosity solution, is more resistence to degradation than native starch, does not react with proteins and amino acids, and is degraded to glucose in vivo, so is easily digestible. The glucan may be used in foods, beverages, food-additives, adhesives, in cyclodextrin production and as a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              vpenleghlykyeivtpdggvlfkadpyafyselrphtas--iaydlkgygwndgswkrk 137
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    148 NRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIAVILDVVYNHI--GPEGNYLLGLG 205
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ----HAIFDNS-PKHILQEIAEK--AHQLGKFVIAESDLNDPKIVKD-----DCGYKID 302
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  AQWVDDF------HHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYR 352
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      376 mgwmndmlkymetppyerrhvhnqvtfsllyays----enfilpfshdevvhgkks--- 427
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ------hpgk 456
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        410 PLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSW--- 466
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | :| : :| |
---aqfdewkfedeldwvlf 482
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ----KVKIEDLIIYELHVGTF-SQEGNFKGVIEKLD----YLKDLGITGIELMPVAQFPG 147
                                                                                                                                                                                                                                                                                                                                                                                                                  Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              FGGNIEKNKG----IFKLWAPYVNSVKL------KLSKKLIPMEKNDEGFFEVE 47
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              IDDIEENLTYSY-IIEDKREI----PDPASRYQPLGVHDKSQLIRTD---YQILDLG----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      198 drswgyggtgyyavtsrygtphdfmyfvdrchqagigvimdwypghfckdahglymfdga
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            353 GRTHGAPVGDLPPRKFVVFIQNHDQVGNRGNG---ERLSILTDKTTYLMAATLYILSPYI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            206 PYF----SDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKTFKIDGLRLDAV----
                                                                                                                                                                                                                                                                                                                                                                        12.2%; Score 360; DB 17; Length 652;
25.3%; Pred. No. 1.7e-24;
ive 72; Mismatches 186; Indels 162;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      AAR23787 standard; Protein; 658 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          :: :: || |:|| |||| 483 dfelhrkmndymkeliacykry 504
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    467 --KIDEEVLDYYKQLINIRKRY 486
                                                                                                                                                                                                                                                                                                                                                                      Query Match
Best Local Similarity 25.3%
Matches 142; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  (first entry)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            457 kllfmgnef-----
                                                                                                                                                                                                                                                                                                                652 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                04-NOV-1992
                                                                                                                                                                                                                                                                                                                  Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          AAR23787;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  80
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              48
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  258
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      256
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  303
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    428
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  AAR23787
      a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  a
                                                                                                                                                                                                                                                                                                                                                                                                                                                      ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Db
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      DXDXXXX
```

Heat-resistant pullanase.

```
-qgi- 522
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    54 NLTYSYII--EDKREI--PDPASRYQPLGVHDKSQLIR-TDYQILD-----LGKVKI 100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             EGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLD---YYKQLINIRKRYNNCKRVKEVRR 497
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 101 EDLIIYELHVGTF--SQEGNF----KGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYD 154
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        146 qplfiyelhfgswkkkedgsfytyqemaeelipyvlehgfthiellplvehpfdrswgyq 205
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 155 GVFLYAVQNTYGGPWELAKLVNEAHKRGIAVILDVVYNHI--GPEGNYLLGLGPYF---- 208
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       This branching enzyme is derived from B.stearothermophilus and is encoded by the glgB gene. It is stable at high temps. and can be produced in large amts. using recombinant techniques. It is a transferase allowing formation of alpha(1-6) branches in starch-like substances. It is useful for extending the shelf life of such materials and can be used in the prepn. of human and animal foods.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        4 FGGNIEKNKGI----FKLWAPYVNSVKLKLS-----KKLIPMEKNDEGFFEVEIDDIEE 53
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               fgahvikkngmvgtrfcvwapharevrlvgsfnewngtnfnlmkvsnggvwmifipenle 85
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Branching enzyme obtd. from Bacillus stearothermophilus - has good thermostability, for use in modifying starch-like substances
                                                                121;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Length 639;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               89; Mismatches 197; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                        Branching enzyme; amylaceous substances; transferase;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       DB 12;
482 gheseq----trkkrqklataivllsqgipflhsgqefyrtk--
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       11.6%; Score 342.5; DB 1
24.9%; Pred. No. 7.2e-23;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Venema G;
                                                                                                                                                                                                                                                                                                                                                                                 B.stearothermophilus branching enzyme
                                                                                                                                                                                                                                                                Ä.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Beldman G,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Disclosure; fig 4; 13pp; English,
                                                                                                                                                                                                                                                           639
                                                                                                                                                                                                                                                           AAR11271 standard; Protein;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Sacillus stearothermophilus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      90EP-0202264
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           89NL-0002128
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  COOP-) COOP VERKOOP AVEBE.
                                                                                                                                                                                                                                                                                                                                          (first entry)
                                                                                                                     EGNCITLIMEKIGIIA 513
                                                                                                                                                          572 nnhlffleptpasiia 587
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Best Local Similarity 24.9
Matches 135; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Kiel JAKW, Boels JM,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             WPI; 1991-088587/13.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  639 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 N-PSDB; AAQ11072
                                                                                                                                                                                                                                                                                                                                                                                                                                             thermostability
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    22-AUG-1990;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         23-AUG-1989;
                                                                                                                                                                                                                                                                                                                                          29-MAY-1991
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            27-MAR-1991
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       EP418945-A.
                                                                                                                                                                                                                                                                                                   AAR11271;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Query Match
                                         441
                                                                              523
                                         ŏ
                                                                            g
                                                                                                                   ò
                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            26;
                                                                                                                                                                                                                                                                                                                                                                           Heat-resistant pullulanase gene – present recombinant plasmid are new and produced in large amts. using a proper host
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | : |:: : | |||:||| ||:||
ffydgdlgvaytrektifkvwaptatevkvklidpktekaeyialerlekgvwtttvfgd 103
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              KIVKDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSR 350
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              351 YRGRTHGAPVGD-----QVGN 380
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           381 RGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVR 440
                                                                                                                                                                                                                                                                                                                                                                                                                                                                        The sequence encoding this protein may be contained in a recombinant plasmid. The heat-resistant pullanase can be produced in large amts. using a suitable host.
Plasmid pTPI contg. the pullanase gene (Japan Patent Apppln. No. 174037/88) was cleaved by various restriction enzymes and inserted into plasmid pV118/119. Single-stranded DNA was prepd. using helper phage M13K07 and the base sequence determined by the dideoxy method.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           52 EENLTYSYII---EDKREIPDPASRYQPLGVHDKSQLIRTDY-QILDLGKVKIE----- 101
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          -----DLIIYELHVGTF-----SQEGNFKGVIEK------LDYLKDLGITGI 137
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ELMPVAOFPG-----NRDWGYDGVFLYAVQNTY----GCPW----ELAKLVNEAHKR 181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     375 silvfgegwdlptp-----lsseqkatmqnaeklpri-gyfndyfrdsvkgst 421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     fqlpdrgfalgdsddrekvkvaisgsigkknglflhptqtinyveshdnhtfwdkmeian 481
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               2 FSFGGNI----EKNKGIFKLWAPYVNSVKLKL-----SKKLIPMEKNDEGFFEVEIDDI 51
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ellpfndfagvdernplqqynwgynplhynapegsyatdpndpyarirelkraihtlgsn
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   GIAVILDVVYNHIGPEGNYL-----LGLGPYFS-DRYKTPWGLTFNFDDRGCDQ--V
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ||:|:::| :| : ::| | | : | | | ::|:
330 rkwlidsvrfwveeyhvngfrfdlm-gildvetmkavreml-------dtldp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 RKFILENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Indels 176;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 12.1%; Score 356; DB 13; Length 658; 22.9%; Pred. No. 4.1e-24;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          200;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                     Claim 3; Page 2-3; 8pp; Japanese
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          66;
                                                                                                                                                                           90JP-0077230
                                                                                                                                                                                                                    90JP-0077230.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Conservative
                                                                                                                                                                                                                                                         (EZAK ) EZAKI GLICO CO (IATR ) IATRON LAB INC
                                                                                                                                                                                                                                                                                                                   WPI; 1992-157263/19.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         658 AA;
                                                                                                                                                                                                                                                                                                                                        P-PSDB; AAR23787
                    Enzyme; pTPI.
                                                                                              JP04099489-A
                                                                                                                                                                           27-MAR-1990;
                                                                                                                                                                                                                    27-MAR-1990;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Local Simi
                                                                                                                                      31-MAR-1992
                                                         Synthetic.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Best Loca
Matches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          275
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              215
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   182
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                291
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 231
```

Dy Oy

à

q

ò

g

ò

90 03

δy

g

9 P

Qγ

26;

Search completed: July 15, 2002, 12:17:34 Job time: 71 sec Appli Appli Appli Appli Appli Appli Appli Appli Appli Appli Appli

```
Sequence 1, Application US/08505377

Patent No. 5856146

GENERAL INFORMATION:
APPLICANT: MITSUZUMI, Hitoshi
APPLICANT: KUBOTA, Michio
APPLICANT: SUGIMOTO, TOSHIYUKİ
TITLE OF INVENTION: RECOMBINANT THERMOSTABLE ENZYME WHICH
TITLE OF INVENTION: RELEASES TREHALOSE FROM NON-REDUCING SACCHARIDE
NUMBER OF SEQUENCES: 19
CORRESPONDENCE ADDRESS:
                                                                                                                                             Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Sequence Seq
                 Sequence
Sequence
Sequence
Sequence
Sequence
Sequence
Sequence
                                                                                                                                                                                                                                                                                                                Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC compatible
COMPUTER: IBM PC compatible
COMPUTER: IBM PC compatible
COMPUTER: IBM PC compatible
COMPUTER: IBM PC compatible
COMPUTER: IBM PC compatible
COMPUTER: IBM PC compatible
COMPUTER: IBM PC compatible
COMPUTER: IBM PC compatible
COMPUTER: Patent No. No. 1995
FILING DATE: (721-7UL.1995
FILING DATE: (721-7UL.1994
FILING DATE: (721-7UL.1994
FILING DATE: (721-7UL.1994
FILING DATE: (721-7UL.1994
FILING DATE: (721-7UL.1995
FILING DATE: (721-7UL.1995
FILING DATE: (721-7UL.1995
FILING DATE: (721-7UL.1995
FILING DATE: (721-7UL.1995
ATPONDEY/AGENT INFORMATION:
NAME: MAME: MANE: INFORMATION:
             US-09-346-237-1
US-09-514-302-4
US-09-514-302-2
US-09-514-599-2
US-09-514-599-4
US-09-313-677-21
US-09-313-677-2
US-09-313-677-19
US-09-313-677-19
US-09-313-677-19
US-08-474-140-11
US-08-474-545-11
US-08-474-545-11
US-08-996-333-11
US-08-996-333-11
US-08-98-98-331-11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                3: Browdy and Neimark
419 Seventh Street N.W. Ste. 300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  REFERENCE/DOCKET NUMBER: MITSUZUMI=1
TELECOMMUNICATION INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     TELEPHONE: (202) 628-5197
TELEFAX: (202) 737-3528
TELEX: 249688
INFORMATION FOR SEQ ID NO: 1:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  : 556 amino acids amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              NAME: Browdy, Roger L
REGISTRATION NUMBER:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             SEQUENCE CHARACTERISTICS:
829
1938
921
921
922
926
928
928
928
928
928
928
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 TOPOLOGY: linear
MOLECULE TYPE: protein
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  CITY: Washington STATE: D.C.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     : D.C.
RY: U.S.A.
20004
ADDRESSEE:
STREET: 419
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                         JS-08-505-377-1
                                                                                                                          264.5
264.5
264.5
250.2
250.2
250.2
250.2
250.2
250.2
250.2
250.2
250.2
250.2
250.2
250.2
250.2
250.2
250.2
250.2
250.2
250.2
July 15, 2002, 12:18:04; Search time 25.09 Seconds (without alignments) 541.277 Million cell updates/sec
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Sequence 1, Appli
Sequence 1, Appli
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Sequence 2, Appli
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Pred. No. is the number of results predicted by chance to have a score greater than or equal to the score of the result being printed and is derived by analysis of the total score distribution.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Sequence 1, P
Sequence 15,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Sequence 11,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Sequence 2,
Sequence 2,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Description
                                                                                                                                                                                                                                 1 MFSFGGNIEKNKGIFKLWAP......KLKKDELIKVNRGVGVYQLE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Sequence 3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Sequence
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  /cgn2_6/ptodata/2/jaa/5A_COMB.pep:*
/cgn2_6/ptodata/2/jaa/5B_COMB.pep:*
/cgn2_6/ptodata/2/jaa/6A_COMB.pep:*
/cgn2_6/ptodata/2/jaa/6B_COMB.pep:*
/cgn2_6/ptodata/2/jaa/PCTUS_COMB.pep:*
/cgn2_6/ptodata/2/jaa/PCTUS_COMB.pep:*
               GenCore version 4.5
Copyright (c) 1993 - 2000 Compugen Ltd.
                                                                                                                                                                                                                                                                                                                                                              Total number of hits satisfying chosen parameters:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 US-08-399-646-12
US-08-607-321-12
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     US-08-961-240-12
US-08-605-501-12
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     -08-410-784A-2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                08-410-784A-4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    US-09-346-237-11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  JS-08-399-646-14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     08-961-240-14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         US-08-399-646-4
US-08-607-321-4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   -08-607-321-1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         -08-528-026C-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                JS-08-961-240-4
                                                                                                                                                                                                                                                                                                                             231628 segs, 24425594 residues
                                                                                                                                                                                                                                                                                                                                                                                                                                                      Post-processing: Minimum Match 0%
Maximum Match 100%
Listing first 45 summaries

    protein search, using sw model

                                                                                                                                                                                                                                                                    BLOSUM62
Gapop 10.0 , Gapext 0.5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Issued_Patents_AA:*
                                                                                                                                                                                                                                                                                                                                                                                                    seq length: 0 seq length: 2000000000
                                                                                                                                                                                               US-09-298-924-8
2954
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Query
Match Length DB
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Title:
Perfect score:
Sequence:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Scoring table:
                                                                                                                                                                                                                                                                                                                                                                                                    DB
DB
                                                                                      OM protein
                                                                                                                                                                                                                                                                                                                             Searched:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Database
                                                                                                                                                                                                                                                                                                                                                                                                    Minimum
                                                                                                                                                                                                                                                                                                                                                                                                                       Maximum
                                                                                                                        Run on
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Result
```

```
61
                                                                                                                                                                                                                                                                                                                                                                                                     61
                                                                                                                                                                                                                                                                                                                                                                                                                       121
                                                                                                                                                                                                                                                                                                                                                                                                                                           121
                                                                                                                                                                                                                                                                                                                                                                                                                                                              181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          541
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  361
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      361
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      541
                                                                                                                                                                                                                                                                                                                                                                                                                                       qq
                                                                                                                                                                                                                                                                                                                                                                                                    qq
                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                 δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                              Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       a
                                                                                                                                                                                                                                                                                                                                                                                                                       Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                á
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  음
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      δ
                                                 ö
                                                                                                                                                                                        240
                                                                                                                                                                                                                               360
                                                                                                                      240
                                                                                                                                                                                                                                                                                GVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHK 180
                                                                                                                                                            GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYYE 420
                                                                                                                                                                                                                                                                                                                                                    TNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYKQLI 480
                                                                                                                                                                                                                                                                                                                                                                                         481 NIRKRYNNCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGIGFPKKLKK 540
                                                                                                            61 IEDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFK 120
                                                 Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     GENERAL INFORMATION:
APPLICANT: MITSUZUMI, HITOShi
APPLICANT: KUBOTA, Michio
APPLICANT: SUGINTO, TOSHIYUKI
TITLE OF INVENTION: RECOMBINANT THERMOSTABLE ENZYME WHICH
TITLE OF INVENTION: RELEASES TREHALOSE FROM NON-REDUCING SACCHARIDE
NUMBER OF SEQUENCES: 19
CORRESPONDENCE ADDRESS:
                                                                               1 MFSFGGNIEKNKGIFKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYI 60
                                                                    1 MFSFGGNIEKNKGIFKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYI 60
                                                                                                                                                                                         RGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEY
                                                                                                                                                                                                   301 IDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPV
                                                 ö
                               556;
                              Length
                                                 Indels
                             Score 2954; DB 2;
Pred. No. 1.1e-280;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SPETWARE: Patentin Release #1.0, Version #1.30 CURRENT APPLICATION DATA:
APPLICATION NUMBER: US/08/798,269
                                                  ö
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ADDRESSEE: Browdy and Neimark
STREET: 419 Seventh Street N.W. Ste. 300
CITY: Washington
                                                0; Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC compatible
OPERATING SYSTEM: PC-DOS/MS-DOS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Sequence 1, Application US/08798269
Patent No. 6027918
                             100.0%;
100.0%;
                                                                                                                                                                                                                                                                                                                                                                                                                                 DELIKVNRGVGVYQLE 556
                                                                                                                                                                                                                                                                                                                                                                                                                                         541 DELIKVNRGVGVYQLE 556
                                                Matches 556; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              COMPUTER READABLE FORM:
                                       Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            U.S.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  STATE: D.C
COUNTRY: U
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    20004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         US-08-798-269-1
US-08-505-377-1
                             Query Match
                                        Best Local
                                                                                                                                                                    121
                                                                                                                                                                                                                               241
                                                                                                                                                  121
                                                                                                                                                                                         181
                                                                                                                                                                                                                                                                                                            361
                                                                                                                                                                                                                                                                                                                                361
                                                                                                                                                                                                                                                                                                                                                    421
                                                                                                                                                                                                                                                                                                                                                                       421
                                                                                                                                                                                                                                                                                                                                                                                                                                541
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 RESULT
                                                                                        g
                                                                                                           ò
                                                                                                                            g
                                                                                                                                                ò
                                                                                                                                                                   g
                                                                                                                                                                                        ò
                                                                                                                                                                                                        q
                                                                                                                                                                                                                              ŏ
                                                                                                                                                                                                                                                ద
                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                               셤
                                                                                                                                                                                                                                                                                                                                                   à
                                                                                                                                                                                                                                                                                                                                                                   qq
                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                               à
                                                                                                                                                                                                                                                                    ò
```

```
360
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              GVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHK 180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  GDLPPRKEVVFIQNHDQVGNRGNGERLSILTDKTTVLMAATLYILSPYIPLIFMGEEYYE 420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              IEDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFK 120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   WFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIVKDDCGYK 300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        RGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 IDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          TNPFFFFSDFSDPVLIKGVREGRLKENNOMIDPQSEEAFLKSKLSWKIDEEVLDYYKOLI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 NIRKRYNNCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGIGFPKKLKK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ö
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Length 556;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      100.0%; Score 2954; DB 3; 100.0%; Pred. No. 1.1e-280;
                            FILING DATE: 21-JUL-1995
APPLICATION NUMBER: JP 190180/1994
FILING DATE: 21-JUL-1994
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP 109128/1995
FILING DATE: 11-APR-1995
PRIOR APPLICATION NUMBER: JP NOT YET RECEIVED FILING DATE: 04-JUL-1995
ATTORNEY/AGERY INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Mismatches
                                                                                                                                                                                                                                            MITSUZUMI-1
                   US/08/505,377
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ;
0
                                                                                                                                                                                                                            25,618
                                                                                                                                                                                                          NAME: Browdy, Roger L
REGISTRATION NUMBER: 25,618
REFERENCE/DOCKET NUMBER: MI
TELECOMMUNICATION INFORMATION:
                                                                                                                                                                                                                                                                           TELEPHONE: (202) 628-5197
TELEFAX: 24968
TELEX: 24968
INFORMATION FOR SEQ ID NO: 1:
                                                                                                                                                                                                                                                                                                                                                                   556 amino acids
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DELIKVNRGVGVYQLE 556
                                                                                                                                                                                                                                                                                                                                               SEQUENCE CHARACTERISTICS:
LENGTH: 556 amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Conservative
                                                                                                                                                                                                                                                                                                                                                                                                              , MOLECULE TYPE: protein US-08-798-269-1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PRIOR APPLICATION DATA
                                                                                                                                                                                                                                                                                                                                                                                   amino acid
                                                                                                                                                                                                                                                                                                                                                                                                       linear
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Similarity
                                                                                                                                                                                                                                                                                                                                                                                                   TOPOLOGY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Query Match
Best Local Simi
Matches 556;
```

ö

m

```
ORGANISM: Artificial Sequence
                                                                                                                                                                                                                                                                                 541 DELIKVNRGVGVYQLE 556
                                                                                                                                                                                                                                                                                               GENERAL INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                 US-09-242-690A-15
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             SOFTWARE: Pa
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        TYPE: PRT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    FEATURE:
                                                      301
                                                                                                            361
                                                                                                                                                                   421
                                                                                                                                                                                            421
                                                                                                                                                                                                                         481
δy
                        g
                                                                           g
                                                                                                            Óγ
                                                                                                                                      В
                                                                                                                                                                  δ
                                                                                                                                                                                         qq
                                                                                                                                                                                                                         ŏ
                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                              QΥ
                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   qq
                                                      Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ö
                                                                                                                    March American
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               240
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 61 IEDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFK 120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      121 GVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHK 180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         1 MFSFGGNIEKNKGIFKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYI 60
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               RGIAVILDVVYNHIGPEGNYLLGLGPPFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          1 MFSFGCNIEKNKGIFKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ő
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Length 556;
                                                                                APPLICANT: KUBGTA, Michio
APPLICANT: SUGIMOTO, TOSHIYUKI
TITLE OF INVENTION: RECOMBLINANT THERMOSTABLE ENZYME WHICH
TITLE OF INVENTION: RELEASES TREHALOSE FROM NON-REDUCING &
                                                                                                                                                                                                                                                                                                 Patentin Release #1.0, Version #1.30 \( \sqrt{\chi}\)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Score 2954; DB 4;
Pred. No. 1.1e-280;
                                                                                                                                                                                                                                                                                                                                                                             PRIOR APPLICATION DATA:
APPLICATION NUMBER: 08/505,377
FILING DATE: 21-JUL-1995
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP 109128/1995
FILING DATE: 11-APR-1995
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP NOT YET RECEIVED APPLICATION NUMBER: JP NOT YET RECEIVED FILING DATE: 04-JUL-1995
ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                  3: Browdy and Neimark
419 Seventh Street N.W. Ste. 300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              0; Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     MITSUZUMI-1
                                                                                                                                                                                                                                                                                                                                     APPLICATION NUMBER: US/09/055,210
                                                                                                                                                                                                                                                                                              PC-DOS/MS-DOS
                        Sequence 1, Application US/09055210 Patent No. 6346394 GENERAL INFORMATION:
                                                                                                                                                                                                                                                                              IBM PC compatible
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      NAME: Browdy, Roger L
REGISTRATION NUMBER: 25,618
REFERENCE/DOCKET NUMBER: MIT
TELECOMMUNICATION INFORMATION:
                                                                 APPLICANT: MITSUZUMI, Hitoshi
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  100.0%;
100.0%;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        TELEX: 249688'
INFORMATION FOR SEQ ID NO: 1:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                 Floppy disk
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     (202) 737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  556 amino acids
amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Query Match
Best Local Similarity 100.
Matches 556; Conservative
                                                                                                                                                                                                                                                                                                                        CURRENT APPLICATION DATA:

; MOLECULE TYPE: protein
US-09-055-210-1
                                                                                                                                                                                                                                                  COMPUTER READABLE FORM: MEDIUM TYPE: Floppy
                                                                                                                                      NUMBER OF SEQUENCES: 1
CORRESPONDENCE ADDRESS:
                                                                                                                                                                                         CITY: Washington
STATE: D.C.
                                                                                                                                                                                                                                                                                            OPERATING SYSTEM:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (202)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 linear
                                                                                                                                                                                                                         U.S.A.
                                                                                                                                                                                                                                                                                                                                                                 CLASSIFICATION:
                                                                                                                                                                                                                                                                                                                                                     FILING DATE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               TELEPHONE:
                                                                                                                                                                  ADDRESSEE:
                                                                                                                                                                                                                                     20004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            TOPOLOGY:
                                                                                                                                                                                                                                                                               .COMPUTER:
                                                                                                                                                                                                                         COUNTRY:
                                                                                                                                                                                                                                                                                                         SOFTWARE:
             -09-055-210-1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             TELEFAX:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    LENGTH:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ద
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           õ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    අ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
```

```
5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               APPLICANT: KONDO, KEIJI
APPLICANT: MUURA, YUTAKA
TITLE OF INVENTION YEAST VECTOR AND METHOD OF PRODUCING PROTEINS USING THE
FILE REFERENCE: 049441/0118
CURRENT APPLICATION NUMBER: US/09/242,690A
CURRENT PAPLICATION NUMBER: PCT/JP97/02924
PRIOR APPLICATION NUMBER: PCT/JP97/02924
PRIOR PILING DATE: 1997-08-22
PRIOR PLIING DATE: 1996-08-23
PRIOR PLIING DATE: 1996-08-23
PRIOR PLIING DATE: 1996-08-23
PRIOR PLIING DATE: 1996-08-23
PRIOR PLIING DATE: 1996-08-23
PRIOR PLIING DATE: 1996-08-23
PRIOR PLIING DATE: 1996-08-23
PRIOR PLIING DATE: 1996-08-23
PRIOR PLIING DATE: 1996-08-23
PRIOR PLIING DATE: 1996-08-23
PRIOR PLIING DATE: 1996-08-23
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ; OTHER INFORMATION: Description of Artificial Sequence: Synthetic protein US-09-242-690A-15
                                                     420
                                                                                                                                                                                                                                                                                                                  TNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYKQLI 480
181 RGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEY 240
                                                                                                                                                                                                                                                                                                                                                                                                  TNPFFFFSDFSDFVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYKQLI 480
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   NIRKRYNNCKRVKEVREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGIGFPKKLKK 540
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     62 EDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFKG 121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         122 VIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKR 181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        3 SFGGNIEKNKGIFKLWAPYVNSVKLK-LSKKLIPMEKNDEGFFEVEIDDIEENLTYSYII 61
                                                                                                                                                                                                                                                                                    GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYYE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              IDAOWVDDFHHAVHAFITKEKDYYYODFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          GIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYW
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  7
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Length 559;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             DB 4;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Query Match 59.2%; Score 1748.5; DB 4; Best Local Similarity 58.9%; Pred. No. 1.3e-162; Matches 329; Conservative 87; Mismatches 136;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Sequence 15, Application US/09242690A Patent No. 6284534
```

12;

Gaps

90;

Length 589; Indels

```
APPLICANT: TSUSAKI, Keiji
APPLICANT: HATTORI, Kazuko
APPLICANT: SUGIMOTO, TOShiyuki
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
                                                                                                                                                                                                                      EIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDL-----IIYELHVGTFSQ 115
                                                                                                                                                                                                                                                              EGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLV 175
                                                                                                                                                                                                                                                                                                                                                                                                                                                              PKIV--KDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGK 347
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             348 YSRYRGRTHGAPV--GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEA 458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             FLKSKLSWK-----IDEEVLDYYKQLINIRKRYNNCKRVKEVRREGNCITLIMEKIGIIA 513
                                                                                                                                 13 GIFKLWAPYVNSVKLKLSKKLIPMEKN-----DEGFFEVEIDDIEENLTYSYIIE-DKR 65
                                                                                                                                                   NEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFIL
                                                                                                                                                                                                                                                                                                                                                                                                ENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGK-----FVIAESDLND
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     481 FTRSKLDWAEASAGDHARLLELYRSLITLR-----RSTPELARLGFADTAV----
                                                        32.8%; SCOIE ... 3.2e-bu, 39.5%; Pred. No. 3.2e-bu, ... 74; Mismatches 195;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      PatentIn Release #1.0, Version #1.30
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     STREET: 419 Seventh Street, N.W., Suite 300 CITY: Washington
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC Compariable
OPERATING SYSTEM: PC-DOS/MS-DOS
SOFTWARE: Patentin Release #1.0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Sequence 2, Application US/08607321
Patent No. 5716813
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        BROWDY AND NEIMARK
                                                                                                  Conservative
protein
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       CORRESPONDENCE ADDRESS:
ADDRESSEE: BROWDY AN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         NUMBER OF SEQUENCES:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          APPLICANT: KUBOTA,
                                                                Query Match
Best Local Similarity
Matches 215; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          GENERAL INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         D.C.
: USA
; MOLECULE TYPE:
US-08-399-646-2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ||||
| 527 EFDD 530
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    20004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            514 SFDD 517
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         US-08-607-321-2
                                                                                                                                                                                                99
                                                                                                                                                                                                                                                                116
                                                                                                                                                                                                                                                                                                                               176
                                                                                                                                                                                                                                                                                                                                                                                                236
                                                                                                                                                                                                                                                                                                                                                                                                                                                             290
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            406
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             459
                                                                                                                                  δ
                                                                                                                                                               g
                                                                                                                                                                                                 ò
                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                ŏ
                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                            qq
                                                                                                                                                                                                                                                                                                                                                                                              ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                            q
                                                                                                                                                                                                                                                                                                                                                                                                                                                             ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            염
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                      Sequence 2, Application US/08399646
Patent No. 5556781
GENERAL INFORMATION:
APPLICANT: KUBOTA, Michio
APPLICANT: TSUSAKI, Keiji
APPLICANT: HATTORI, Kazii
APPLICANT: SUGIMOTO, TOSHIYUKI
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: BUZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
NUMBER OF SEQUENCES: 18
CORRESPONDENCE ADDRESS:
                                                                                                                                             359
                                                                                                                                                                                                                                301
                                                                                                                361
                                 FKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIV--KDDCGY
                                                                               KIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAP
                                                                                                                                                                                                               ETNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYKQL
                                                                                                                                                                                                                                                                               INIRKRYN-NCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGI--GFPK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    COMPUTER: IN PC compatible
OPERATING SYSTEM: PC-DOS/MS-DOS
SOFTWARE: Patentin Release #1.0, Version #1.30
SOFTWARE: PATENTION DATA:
APPLICATION NUMBER: US/08/399,646
FILING DATE: 07-MAR-1995
CLASSIFICATION: 435
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       SEE: BROWDY AND NEIMARK
1: 419 Seventh Street, N.W., Suite 300
Washington
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  REFERENCE/DOCKET NUMBER: KUBOTA-5
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     PRIOR APPLICATION DATA:
APPLICATION NUMBER: UP 59834
FILING DATE: 07-4AR-1994
PRIOR APPLICATION DATA:
APPLICATION NUMBER: UP 59840
FILING DATE: 07-4AR-1994
ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        25,618
                                                                                                                                                                                                                                                                                                                                              537 KLKKDELIKVNRGVGVYQL 555
                                                                                                                                                                                                                                                                                                                                                                   542 HIEEGK-YEFDKGFALYKL 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy disk
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     589 amino acids
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       NAME: BROWDY, ROGER L. REGISTRATION NUMBER: 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 TELEX: 248633
INFORMATION FOR SEQ ID NO:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             <u>ں</u>
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          20004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ADDRESSEE:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     TYPE: ami
TOPOLOGY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          STATE: D
COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        TELEFAX:
                                                                                                                                                                                                                                                                                                                                                                                                                                RESULT 5
US-08-399-646-2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        STREET:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       LENGTH:
                                                                                                                                                                                                                                             422
                242
                                                                               300
                                                                                                                                                                                                               420
                                                                                                                                                                                                                                                                              480
                                               g
                                                                                                           QQ
                                                                                                                                                                             QQ
                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                            셤
                ò
                                                                               ò
                                                                                                                                             ò
                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                         q
```

```
APPLICANT: TSUSAKI, Keiji
APPLICANT: HATTORI, KAZUKO
APPLICANT: SUGIMOTO, TOSHIYUKI
APPLICANT: SUGIMOTO, TOSHIYUKI
TITLE OF INVENTION: DNA BUCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           66 EIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDL------IIYELHVGTFSQ 115
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              116 EGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLV 175
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          176 NEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFIL 235
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            13 GIFKLWAPYVNSVKLKLSKKLIPMEKN ----- DEGFFEVEIDDIEENLTYSYIIE-DKR 65
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   90;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Length 589,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         74; Mismatches 195; Indels
                                                                                                                                                                                                                                                                                                                                                                                      MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC compatible
OPERATING SYSTEM: PC-DOS/MS-DOS
SOFTWARE: Patentin Release #1.0, Version #1.30
CURRENT APPLICATION DATA:
FILING DATE: 30-OCT-1997
CLASSIFICATION: 435
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Score 969; DB 2;
Pred. No. 3.2e-86;
                                                                                                                                                                                                                                                           3: BROWDY AND NEIMARK
419 Seventh Street, N.W., Suite 300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PRIOR APPLICATION DATA:
APPLICATION NUMBER: US 08/399,646
FILING DATE: 07-MAR-1995
APPLICATION NUMBER: UP 59834
FILING DATE: 07-MAR-1994
PRIOR APPLICATION NUMBER: UP 59840
FILING DATE: 07-MAR-1994
ATTORNEY, AGENT: INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      KUBOTA-5
                                                  Sequence 2, Application US/08961240 Patent No. 5830715
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      REFERENCE/DOCKET NUMBER: KU
TELECOMMUNICATION INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    32.8%;
39.5%;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   : 589 amino acids
amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         202-628-5197
202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Query Match
Best Local Similarity 39.58
Matches 215; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 NAME: BROWDY, ROGER L. REGISTRATION NUMBER: 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              TELEX: 248633
INFORMATION FOR SEQ ID NO:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SEQUENCE CHARACTERISTICS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ; MOLECULE TYPE: protein US-08-961-240-2
                                                                                                                                                                                                                      NUMBER OF SEQUENCES: 1
CORRESPONDENCE ADDRESS:
                                                                                                                                                                                                                                                                                                                                                                         COMPUTER READABLE FORM:
                                                                                                                                                                                                                                                                                           CITY: Washington
STATE: D.C.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        TOPOLOGY: linear
                                                                                                             KUBOTA,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        FILING DATE: 30 CLASSIFICATION:
                                                                                       GENERAL INFORMATION:
APPLICANT: KUBOTA
                                                                                                                                                                                                                                                                                                                                                     20004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             TELEPHONE:
                                                                                                                                                                                                                                                           ADDRESSEE:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                TELEFAX:
                                                                                                                                                                                                                                                                                                                                    COUNTRY:
                                                                                                                                                                                                                                                                               STREET:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Db
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                QΥ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    12;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              348 YSRYRGRTHGAPV--GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEA 458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 66 EIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDL------IIYELHVGTFSQ 115
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       116 EGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLV 175
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  176 NEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFIL 235
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        236 ENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGK-----FVIAESDLND 289
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  290 PKIV--KDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGK 347
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               459 FLKSKLSWK----IDEEVLDYYKQLINIRKRYNNCKRVKEVRREGNCITLIMEKIGIIA 513
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  13 GIFKLWAPYVNSVKLKLSKKLIPMEKN-----DEGFFEVEIDDIEENLTYSYIIE-DKR 65
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Length 589;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Query Match 32.8%; Score 969; DB 1; Best Local Similarity 39.5%; Pred. No. 3.2e-86; Matches 215; Conservative 74; Mismatches 195
                                                                  PRIOR APPLICATION DATA:
APPLICATION NUMBER: US 08/399,646
FILING DATE: 07-MAR-1995
APPLICATION NUMBER: JP 59834
FILING DATE: 07-MAR-1994
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP 59840
FILING DATE: 07-MAR-1994
ATTORNEY, AGENT INFORMATION:
                                                                                                                                                                                                                                                                             KUBOTA=5
           JABER: US/08/607,321
26-FEB-1996
                                                                                                                                                                                                                                        NAME: BROWDY, ROGER L.
REGISTRATION NUMBER: 25,618
REFERENCE/DOCKET NUMBER: KUBG
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
TELEPHAX: 202-737-3528
                                                                                                                                                                                                                                                         25,618
                                                                                                                                                                                                                                                                                                                                                     TELEX: 248633
INFORMATION FOR SEQ ID NO: 2:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                  589 amino acids
CURRENT APPLICATION DATA:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    MOLECULE TYPE: protein
                                                                                                                                                                                                                                                                                                                                                                                                                                 amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                       linear
                                                    CLASSIFICATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       514 SFDD 517
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            EFDD 530
                                                                                                                                                                                                                                                                                                                                                                                                                                               TOPOLOGY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        US-08-607-321-2
                                                                                                                                                                                                                                                                                                                                                                                                                LENGTH:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    481
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    406
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            527
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   유
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               음
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
```

å ద ò

ò

12;

9

amino acid

```
δλ
                                                                                                                                                                              g
                                                                                                                                                                                                              δy
                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                            δ
                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                  d
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                QΫ́
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Keiji
APPLICANT: SUGINOTO, TOShiyuki
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
NOMBER OF SEQUENCES: 18
CORRESPONDENCE ADDRESS:
ADDRESSEE: BROWDY AND NEIMARK
STREET: 419 Seventh Street, N.W., Suite 300
CITY: Washington
STATE: D.C.
348 YSRYRGRTHGAPV--GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                            SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM------IDPQSEEA 458
                                                                PKIV---KDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGK
                                                                                                                                                                                                                                                          FLKSKLSWK-----IDEEVLDYYKQLINIRKRYNNCKRVKEVRREGNCITLIMEKIGIIA
                                                                                                                                                                                                                                                                              MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC compatible
COMPUTER: IBM PC COMPATIBLE
SOFTWARE: PATENTIN Release #1.0, Version #1.30
CURRENT APPLICATION DATA:
APPLICATION NUMBER: US/08/605,501
FILING DATE: 26-FEB-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              CLASSIFICATION: 435
PRIOR APPLICATION DATA:
APPLICATION NUMBER: US 08/399,646
FILING DATE: 07-MAR-1995
APPLICATION NUMBER: JP 59834
FILING DATE: 07-MAR-1994
PRIOR APPLICATION DATA:
                                                                                                                                                                                                                                                                                                                                                                                                                                 Sequence 2, Application US/08605501
Patent No. 5834287
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           APPLICATION NUMBER: JP 59840 FILING DATE: 07-MAR-1994 ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        REFERENCE/DOCKET NUMBER: KU
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       TELEX: 248633
INFORMATION FOR SEQ ID NO: 2:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 KUBOTA, Michio
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       COMPUTER READABLE FORM:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            NAME: BROWDY, Roger
REGISTRATION NUMBER:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                GENERAL INFORMATION:
APPLICANT: KUBOTA,
                                                                                                                                                                                                                                                                                                                       514 SFDD 517
                                                                                                                                                                                                                                                                                                                                                   527 EFDD 530
                                                                                                                                                                                                                                                                                                                                                                                                                  US-08-605-501-2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         COUNTRY:
                                                              290
                                                                                                                                                                                            406
                                                                                                                                                                                                                                                          459
                                                                                          g
                                                                                                                                                            g
                                                              ò
                                                                                                                             õ
                                                                                                                                                                                            ò
                                                                                                                                                                                                                      qq
                                                                                                                                                                                                                                                                                     qq
                                                                                                                                                                                                                                                                                                                    οζ
                                                                                                                                                                                                                                                         ò
```

```
12;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       APPLICANT: KUBOTA, Michio
APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Keiji
APPLICANT: HATTONI, Kazuko
APPLICANT: SUGIMOTO, TOSHIYUKi
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
CORRESPONDENCE ADDRESS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     EIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDL------IIYELHVGTFSQ 115
                                                                                                                                                                                                                                                                                                                                               68 PLPDPRTRRQPEGVH---ALSRT----FDPGAHRWQDAGWQGRELQGSVIYELHIGTFTP 120
                                                                                                                                                                                                                                                                                                                                                                                            EGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLV 175
                                                                                                                                                                                                                                                                                                                                                                                                                      176 NEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFIL 235
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGK-----FVIAESDLND 289
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               301 PRLLYPRDVNGYGLAGQWSDDFHHAVHVNVSGETTGYYSDFDSLGALAKVLRDGFFHDGS 360
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         YSRYRGRIHGAPV -- GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  290 PKIV--KDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGK 347
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           459 FLKSKLSWK----IDEEVLDYYKQLINIRKRYNNCKRVKEVRREGNCITLIMEKIGIIA 513
                                                                                                                                                                Gaps
                                                                                                                                                                                                           13 GIFKLWAPYVNSVKLKLSKKLIPMEKN-----DEGFFEVEIDDIEENLTYSYIIE-DKR 65
                                                                                                                                                                                                                                                     8 GRFDIWAPEAGTVTLLAGGERYEMGRRPGNGPADEGWWTAADAPTGADVDYGYLLDGDEI 67
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Length 589;
                                                                                                                                                                Indels
                                                                                                            ; Score 969; DB 2; L;
; Pred. No. 3.2e-86;
74; Mismatches 195;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         STREET: 419 Seventh Street, N.W., Suite 300 CITY: Washington STATE: D.C.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Sequence 12, Application US/08399646 Patent No. 5556781 GENERAL INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              IBM PC compatible
                                                                                                               32.8%;
                                                                                                               Query Match 32.8%
Best Local Similarity 39.5%
Matches 215; Conservative
; TOPOLOGY: linear
; MOLECULE TYPE: protein
US-08-605-501-2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 COMPUTER READABLE FORM: MEDIUM TYPE: Floppy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     527 EFDD 530
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       20004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  514 SFDD 517
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                COMPUTER:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  US-08-399-646-12
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                            116
                                                                                                                                                                                                                                                                                                                                                                                                                                    121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            348
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           236
```

```
APPLICANT: TSUSAKI, Keiji
APPLICANT: HATTONI, KEZUKO
APPLICANT: BATTONI, TSASUKO
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
CORRESPONDENCES: 18
CORRESPONDENCE ADDRESS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       66 EIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDL------IIYELHVGTFSQ 115
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           EGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLV 175
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        NEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFIL 235
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            13 GIFKLWAPYVNSVKLKLSKKLIPMEKN-----DEGFFEVEIDDIEENLTYSYIIE-DKR 65
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   60;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Length 596;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    32.8%; Score 969; DB 1; Length 596
39.5%; Pred. No. 3.2e-86;
ive 74; Mismatches 195; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                           Version #1.30
                                                                                                                                                                                                                                                               E: BROWDY AND NEIMARK
419 Seventh Street, N.W., Suite 300
                                                                                                                                                                                                                                                                                                                                                                                                           JESTEM: PC-DOS/MS-DOS
SUFTWARE: PatentIn Release #1.0, Ve
CURRENT APPLICATION DATA:
APPLICATION NUMBER: US/08/607,321
FILING DATE: 26-FEB-1996
CLASSIFICATION: 435
PRIOR APPLICATION: ADDITION
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  PRIOR APPLICATION DATA:
APPLICATION NUMBER: US 08/399,646
FILING DATE: 07-MAR-1994
APPLICATION NUMBER: UP 59834
PRIOR APPLICATION DATA:
APPLICATION NUMBER: UP 59840
FILING DATE: 07-MAR-1994
ATTORNEY/AGENT INFORMATION:
                                                   Sequence 12, Application US/08607321
Patent No. 5716813
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
TELEFAX: 202-737-3528
                                                                                                                                                                                                                                                                                                                                                                           COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy disk
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               REFERENCE/DOCKET NUMBER:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Query Match 32.8%
Best Local Similarity 39.5%
Matches 215; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      596 amino acids
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          NAME: BROWDY, ROGER L. REGISTRATION NUMBER: 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         TELEX: 248633
INFORMATION FOR SEQ ID NO:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         protein
                                                                                                                                                                                                                                                                                                  CITY: Washington STATE: D.C.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       TOPOLOGY: linear
                                                                                            GENERAL INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       MOLECULE TYPE:
                                                                                                                                                                                                                                                                                                                                                              20004
                                                                                                                                                                                                                                                                 ADDRESSEE:
                                   US-08-607-321-12
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             US-08-607-321-12
                                                                                                                                                                                                                                                                                                                                            COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      LENGTH:
                                                                                                                                                                                                                                                                                      STREET:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    116
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             12;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ENVEYWERTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGK-----FVIAESDLND 289
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             348 YSRYRGRTHGAPV--GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          66 EIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDL.....IIYELHVGTFSQ 115
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                116 EGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLV 175
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   290 PKIV--KDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGK 347
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 368 YSSFRGRCHGRPINFSAVHPAALVVCSQNHDQIGNRATGDRLSQSLPYGSLALAAVLTLT 427
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       406 SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM------IDPQSEEA 458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                459 FLKSKLSWK----IDEEVLDYYKQLINIRKRYNNCKRVKEVRREGNCITLIMEKIGIIA 513
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   13 GIFKLWAPYVNSVKLKLSKKLIPMEKN-----DEGFFEVEIDDIEENLTYSYIIE-DKR 65
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          176 NEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFIL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        32.8%; Score 969; DB 1; Length 596; 39.5%; Pred. No. 3.2e-86; Live 74; Mismatches 195; Indels
                 PatentIn Release #1.0, Version #1.30
                       SOFTWARE: PATENTIN KELGASE #1.0, VET CURRENT APPLICATION DATA:
APPLICATION NUMBER: US/08/399,646
FILING DATE: 07-MAR-1995
CLASSIFICATION: 435
PRIOR APPLICATION DATA:
APPLICATION NUMBER: UP 59834
FILING DATE: 07-WAR-1994
PRIOR APPLICATION DATA:
APPLICATION NUMBER: UP 59840
FILING DATE: 07-WAR-1994
ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                                                                                                                             REFERENCE/DOCKET NUMBER: KUBOTA-5
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
TELEFAX: 202-737-3528
OPERATING SYSTEM: PC-DOS/MS-DOS
                                                                                                                                                                                                                                             NAME: BROWDY, Roger L. REGISTRATION NUMBER: 25,618
                                                                                                                                                                                                                                                                                                                                                            TELEX: 248633
INFORMATION FOR SEQ ID NO: 12:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                       596 amino acids
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Best Local Similarity 39.5%
Matches 215; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                            MOLECULE TYPE: protein
                                                                                                                                                                                                                                                                                                                                                                                                                                       amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                               linear
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           SFDD 517
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             534 EFDD 537
                                                                                                                                                                                                                                                                                                                                                                                                                                                           TOPOLOGY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                US-08-399-646-12
                                                                                                                                                                                                                                                                                                                                                                                                                       LENGTH:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           514
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
```

12;

q

œ

Page

```
MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC compatible
                                                                                                                                Matches 215; Conservative
        ; TOPOLOGY: linear; MOLECULE TYPE: protein US-08-961-240-12
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         COMPUTER READABLE FORM: MEDIUM TYPE: Floppy
amino acid
                                                                                                Query Match
Best Local Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        CITY: Washington
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               514 SFDD 517
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             534 EFDD 537
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  US-08-605-501-12
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          STATE:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           368
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              459
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               488
                                                                                                                                                                                                                                                                                                                                     128
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           290
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            308
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             406
                                                                                                                                                                 δ
                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                     οy
                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                        ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             q
                                                                                                                                                                                                                                                                                                                                                                                                                                                               Sequence 12, Application US/08961240

Patent No. 5830715

GENERAL INFORMATION:
APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Keiji
APPLICANT: HATYORI, Kazuko
TITLE OF INVENTION: ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: BNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: BNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: BNA ENCODING ENZYME, TRANSFORWANT, AND THEIR PREPARATIONS AND USE
NUMBER OF SEQUENCES: 18
CORRESPONDENCE ADDRESS:
ADDRESSEE: BROWDY AND NEIMARK
STREET: 419 Seventh Street, N.W., Suite 300
CITY: Washington
STATE: D.C.
                               348 YSRYRGRTHGAPV - GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                 406 SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNOM------IDPQSEEA 458
                                                                                                                                                                                                                                    459 FLKSKLSWK----IDEEVLDYYKQLINIRKRYNNCKRVKEVRREGNCITLIMEKIGIIA 513
                                                                             290 PKIV--KDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGK 347
                                                                                                                                                                                                                                                                                                     | :||| | : | : | : | : | : | 488 FTRSKLDWAEASAGDHARLLELYRSLITLR-----RSTPELARLGFADTAV-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        COMPUTER READABLE FORM:

COMPUTER READABLE FORM:

MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC compatible
COMPUTER: IBM PC compatible
COMPUTER: DATE: PC-DOS/MS-DOS
SOFTWARE: Patentin Release #1.0, Version #1.30
CURRENT APPLICATION DATE: 30-CT-1997
FILING DATE: 30-CT-1997
CLASSIFICATION: 435
PRIOR APPLICATION NOMBER: US 08/399,646
FILING DATE: 07-MAR-1995
FILING DATE: 07-MAR-1995
FILING DATE: 07-MAR-1994
PRIOR APPLICATION NUMBER: JP 59834
FILING DATE: 07-MAR-1994
              ENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGK---
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                APPLICATION NUMBER: JP 59840
FILING DATE: 07-MAR-1994
ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      TELEFAX: 202-/5/ ---
TELEFAX: 24863
INFORMATION FOR SEQ ID NO: 12:
SEQUENCE CHARACTERISTICS:
TENGTH: 596 amino acids
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   NAME: BROWDY, ROGER L. REGISTRATION NUMBER: 25,618 REFERENCE/DOCKET NUMBER: KTELECOMMUNICATION INFORMATION: TELECOMMUNICATION: 202-628-5197
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              USA
                                                                                                                                                                                                                                                                                                                                                   514 SFDD 517
                                                                                                                                                                                                                                                                                                                                                                                   534 EFDD 537
                                                                                                                                                                                                                                                                                                                                                                                                                                                      US-08-961-240-12
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         COUNTRY:
              38
                                          8
                                                                             οχ
                                                                                                         g
                                                                                                                                              ò
                                                                                                                                                                              ద
                                                                                                                                                                                                            ολ
                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                            q
                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                 g
```

```
12;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Sequence 12, Application US/08605501
Patent No. 5834287
GENERAL INFORMATION:
GENERAL INFORMATION:
APPLICANT: KUBOTA, Michio
APPLICANT: TSUSAKI, Keiji
APPLICANT: HATTORI, Kazuko
APPLICANT: SUGIMOTO, Toshiyuki
TITLE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
NUMBER OF SEQUENCES: 18
CORRESPONDENCE ADDRESS:
ADDRESSEE: BROWDY AND NEIMARK
                                                                                                                                                                                       66 EIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDL------IIYELHVGTFSQ 115
                                                                                                                                                                                                                  116 EGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLV 175
                                                                                                                                                                                                                                                                                                            176 NEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFIL 235
                                                                                                                                                                                                                                                                                                                                                                                                   PKIV--KDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGK 347
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGK-----FVIAESDLND 289
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            YSRYRGRTHGAPV -- GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  FLKSKLSWK-----IDEEVLDYYKQLINIRKRYNNCKRVKEVRREGNCITLIMEKIGIIA 513
                                                                                              13 GIFKLWAPYVNSVKLKLSKKLIPMEKN-----DEGFFEVEIDDIEENLTYSYIIE-DKR 65
                                                                                                                             SPYIPLIFMGEEYYETUPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEA
                                                     60;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Length 596;
                                                Indels
32.8%; Score 969; DB 2; L
39.5%; Pred. No. 3.2e-86;
1ve 74; Mismatches 195;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               E: BROWDY AND NEIMARK
419 Seventh Street, N.W., Suite 300
```

```
Sequence 4, Application US/08399646
Patent No. 5556781
GENERAL INFORMATION:
APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Keiji
APPLICANT: SUGIMOTO, TOSHIJUKI
APPLICANT: BUTTORI, Kazuko
APPLICANT: BUTTORI, Kazuko
APPLICANT: BUTTORI, Kazuko
APPLICANT: BUTTORI, Kazuko
APPLICANT: BUTTORI, Kazuko
APPLICANT: APATORI, Kazuko
APPLICANT: APATORI, Kazuko
APPLICANT: APATORI, Kazuko
APPLICANT: ASUGIMOTO: DIA BROODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
NUMBER OF SEQUENCES:
ADDRESSEE: BROWDY AND NEIMARK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       124 EKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGI 183
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    184 AVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFK 243
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            68 PDPASRYQPLGVHDKSQLI-RTDYQILD---LGKVKIEDLIIYELHVGTFSQEGNFKGVI 123
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              15 FKLWAPYVNSVKLKLSKKLIPMEK-----NDEGFFEVEIDDIEENLTYSYIIE-DKREI 67
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        137 GKLDYLAGLGVDFIELLPVNAFNGTHNWGYDGVQWFAVHEAYGGPEAYQRFVDAAHAAGL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     34;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Length 597;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     186; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SOFTWARE: PatentIn Release #1.0, Version #1.30
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           32.5%; Score 959; DB 1; 40.2%; Pred. No. 3.1e-85;
                                                                                                                                                                                                                                                                                                                             ADDRESSEE: BROWDY AND NEIMARK
STREET: 419 Seventh Street, N.W., Suite 300
CITY: Washington
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  81; Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  KUBOTA=5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    CURRENT APPLICATION DATA:
APPLICATION NUMBER: US/08/399,646
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  3: Floppy disk
IBM PC compatible
3YSTEM: PC-DOS/MS-DOS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP 59834
FILING DATE: 07-WAR-1994
PRIOR APPLICATION DATA:
APPLICATION NUMBER: JP 59840
FILING DATE: 07-WAR-1994
ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       NAME: BROWDY, ROGER L. REGISTRATION NUMBER: 25,618
REFERENCE/DOCKET NUMBER: KU
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           FILING DATE: 07-MAR-1995
CLASSIFICATION: 435
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              : 597 amino acids
amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Best_Local Similarity 40.2%
Matches 202; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               TELEX: 248633
INFORMATION FOR SEQ ID NO:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           protein
                                                                                                                                                                                                                                                                                                                                                                                                                                                                COMPUTER READABLE FORM:
MEDIUM TYPE: Floppy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             OPERATING SYSTEM:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           linear
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             MOLECULE TYPE:
                                                                                                                                                                                                                                                                                                                                                                                                       D.C.
  534 EFDD 537
                                                                                                                                                                                                                                                                                                                                                                                                                                          20004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            COMPUTER:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         TOPOLOGY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           TELEFAX:
                                                               RESULT 13
US-08-399-646-4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                US-08-399-646-4
                                                                                                                                                                                                                                                                                                                                                                                                                         COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                       STATE:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Query Match
  q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   12;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGK-----FVIAESDLND 289
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  348 YSRYRGRIHGAPV--GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            66 EIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDL~~~~~IIYELHVGTFSQ 115
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  116 EGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLV 175
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              NEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFIL 235
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      PKIV -- KDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGK 347
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     1:::: :| ||: || || |||||||| :: | || ||: || :| ||: || 308 PRLLYPRDVNGYGLAGQMSDDFHHAVHVNVSGETTGYYSDFDSLGALAKVLRDGFFHDGS 367
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM------IDPQSEEA 458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   60; Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          13 GIFKLWAPYVNSVKLKLSKKLIPMEKN-----DEGFFEVEIDDIEENLTYSYIIE-DKR 65
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 15 GRFDIWAPEAGTVTLLAGGERYEMGRRPGNGPADEGWWTAADAPTGADVDYGYLLDGDEI 74
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      FLKSKLSWK-----IDEEVLDYYKQLINIRKRYNNCKRVKEVRREGNCITLIMEKIGIIA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Length 596;
OPERATING SYSTEM: PC-DOS/MS-DOS
SOFTWARE: PatentIn Release #1.0, Version #1.30
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ; Score 969; DB 2; L; Pred. No. 3.2e-86; 74; Mismatches 195;
                                                                                               CLASSIFICATION: 435
PRIOR APPLICATION WHER: 08/399,646
FILING DATE: 07-MAR-1995
FILING DATE: 07-MAR-1994
FILING DATE: 07-MAR-1994
PRIOR APPLICATION DATE:
                                                                                                                                                                                                                                                                                                                                                            KUBOTA=5
                                                            US/08/605,501
                                                                                                                                                                                                                                                 APPLICATION NUMBER: JP 59840 FILING DATE: 07-MAR-1994 ATTORNEY/AGENT INFORMATION:
                                                                                                                                                                                                                                                                                                                                      25,618
                                                                                                                                                                                                                                                                                                              NAME: BROWDY, ROGER L.
REGISTRATION NUMBER: 25,618
REFERENCE/DOCKET NUMBER: KUI
TELECOMMUNICATION INFORMATION:
TELEPHONE: 202-628-5197
                                                                                                                                                                                                                                                                                                                                                                                                                                                                12:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       32.8%;
39.5%;
                                                                                26-FEB-1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Query Match 32.8%;
Best Local Similarity 39.5%;
Matches 215; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     : 596 amino acids
amino acid
                                  CURRENT APPLICATION DATA:
APPLICATION NUMBER: US,
                                                                                                                                                                                                                                                                                                                                                                                                                                        TELEX: 248633
INFORMATION FOR SEQ ID NO:
                                                                                                                                                                                                                                                                                                                                                                                                                  202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SEQUENCE CHARACTERISTICS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ; MOLECULE TYPE: protein US-08-605-501-12
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       inear
                                                                                  FILING DATE:
                                                                                                                                                                                                                                                                                                                                                                                               TELEPHONE:
TELEFAX: 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SFDD 517
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 TOPOLOGY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       LENGTH:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              176
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              236
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               290
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   459
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              488
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        514
```

셤

ò g ò g δ 10;

g

ò g ò 셤 g ŏ

```
APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Keiji
APPLICANT: TSUSAKI, Kazuko
APPLICANT: SUGIMOTO, TOSHIYUKI
TTILE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND
TITLE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
NOMBER OF SEQUENCES: 18
CORRESPONDENCE ADDRESS:
ADDRESSEE: BROMDY AND NEIMARK
STREET: 419 Seventh Street, N.W., Suite 300
                        TFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFV----IAESDLNDPKIV--KD 295
                                                                                          296 DCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRT 355
                                                                                                                                                                                    HGAPV --GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIF 413
                                                                                                                                                                                                                                                                                   MGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEAFLKSKLSW 466
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             MEDIUM TYPE: Floppy disk
COMPUTER: IBM PC Compatible
COMPUTER: Ploppy disk
COMPUTER: IBM PC Compatible
CORFRANTING SYSTEM: PC-DOS/MS-DOS
SOFTWARE: Patentin Release #1.0, Version #1.30
CURRENT APPLICATION DATA:
APPLICATION NUMBER: US/08/607,321
FILING DATE: 26-FEB-1996
CLASSIFICATION DATA: APPLICATION DATA:
APPLICATION NUMBER: US 98/399,646
FILING DATE: 07-MAR-1994
PRIOR APPLICATION DATA:
APPLICATION NUMBER: UP 59840
FILING DATE: 07-MAR-1994
ATLONG DATE: 07-MAR-1994
ATLONG DATE: 07-MAR-1994
ATLONG DATE: 07-MAR-1994
ATLONG DATE: 07-MAR-1994
ATLONG DATE: 07-MAR-1994
ATLONG DATE: 07-MAR-1994
ATLONG DATE: 07-MAR-1994
ATLONG DATE: 07-MAR-1994
ATLONG DATE: 07-MAR-1994
ATLONG DATE: 07-MAR-1994
ATLONG DATE: 07-MAR-1994
                                                                                                                                                                                                                                                                                                                                                                                                              497 AEAAEGDHARLLELYRSLTALRR 519
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Sequence 4, Application US/08607321 Patent No. 5716813 GENERAL INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                           467 KIDEE-----VLDYYKQLINIRK 484
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 25,618
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           TELECOMMUNICATION INFORMATION TELEPHONE: 202-628-5197 TELEFAX: 202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       REFERENCE/DOCKET NUMBER:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        : 597 amino acids
amino acid
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         NAME: BROWDY, Roger L. REGISTRATION NUMBER: 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             TELEX: 248633
INFORMATION FOR SEQ ID NO:
SEQUENCE CHARACTERISTICS:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ; ropology: linear
; MOLECULE TYPE: protein
US-08-607-321-4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              COMPUTER READABLE FORM:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Washington
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    20004
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  US-08-607-321-4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    CITY: W
                                                                                                                                                                                       356
                                                                                                                                                                                                                                377
                                                                                                                                                                                                                                                                                 414
                                                                                                                                                                                                                                                                                                                             437
                                                                                       ò
                                                                                                                                 g
                                                                                                                                                                                    ò
                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                          ŏ
                                                                                                                                                                                                                                                                                                                           Q
                                                                                                                                                                                                                                                                                                                                                                              ò
```

```
10;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            BERAL INFORMATION:

APPLICANT: KUBOTA, Michic

APPLICANT: TSUSAKI, Keiji

APPLICANT: HATTORI, Kazuko

APPLICANT: SUGIMOTO, TOShiyuki

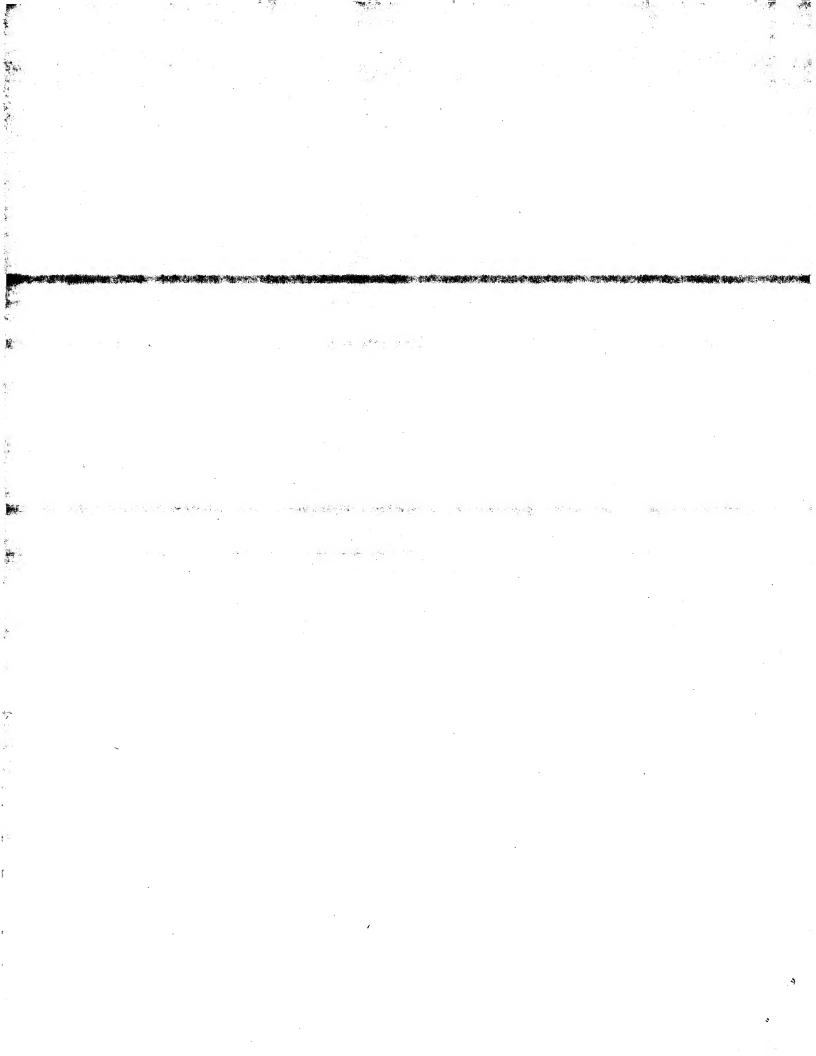
APPLICANT: SUGIMOTO, TOShiyuki

"TTIE OF INVENTION: DNA ENCODING ENZYME, RECOMBINANT DNA AND

"TTIE OF INVENTION: ENZYME, TRANSFORMANT, AND THEIR PREPARATIONS AND USE
                                                                                                                                                             |||| :| || ||| || :
PDPRTRRQPDGVHALSRTFDPSAYSWQDDAWQGR-ELQGAVIYELHLGTFTPEGTLEAAA 136
                                                                                                                                                                                                                            PDPASRYQPLGVHDKSQL1-RTDYQILD---LGKVKIEDLIIYELHVGTFSQEGNFKGVI 123
                                                                                                                                                                                                        124 EKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGI 183
                                                                                                                                                                                                                                                                         184 AVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFK 243
                                                                                                                                                                                                                                                                                                                                          244 TFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFV-----IAESDLNDPKIV--KD 295
                                                                                                                                                                                                                                                                                                                                                                                                         DCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRT 355
                                                                         15 FKLWAPYVNSVKLKLSKKLIPMEK-----NDEGFFEVEIDDIEENLTYSYIIE-DKREI 67
                                                                                               HGAPV--GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       114 MGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEAFLKSKLSW
                                         34;
      Length 597;
                                         Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    OPERATING SYSTEM: PC_DOS/MS-DOS
SOFTWARE: PatentIn Release #1.0, Version #1.30
CURRENT APPLICATION DATA:
                                         Mismatches 186;
        Score 959; DB 1;
Pred. No. 3.1e-85;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  APPLICATION NUMBER: US/08/961,240 FILING DATE: 30-OCT-1997 CLASSIFICATION: 435 PRIOR APPLICATION DATE: APPLICATION NUMBER: US 08/399,646
32.5%; Scor
40.2%; Pred
htive 81;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Sequence 4, Application US/08961240 Patent No. 5830715 GENERAL INFORMATION:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        467 KIDEE-----VLDYYKQLINIRK 484
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     497 AEAAEGDHARLLELYRSLTALRR 519
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       STREET: 419 Sever CITY: Washington STATE: D.C.
                         Similarity
                                         Matches 202;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         COUNTRY:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         RESULT 15
US-08-961-240-4
        Query Match
Best Local 3
                                                                                                                                          89
                                                                                                          g
                                                                                                                                          δ
                                                                                                                                                                       d
                                                                                                                                                                                                        δý
                                                                                                                                                                                                                                     qq
                                                                                                                                                                                                                                                                         QΥ
                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                        Ωý
                                                                                                                                                                                                                                                                                                                                                                       d
                                                                                                                                                                                                                                                                                                                                                                                                         Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                    q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          QΥ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        δλ
```

```
10;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            68 PDPASRYQPLGVHDKSQLI-RTDYQILD---LGKVKIEDLIIYELHVGTFSQEGNFKGVI 123
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       124 EKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGI 183
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                244 TFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFV-----IAESDLNDPKIV--KD 295
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Query Match 32.5%; Score 959; DB 2; Length 597;
Best Local Similarity 40.2%; Pred. No. 3.1e-85;
Matches 202; Conservative 81; Mismatches 186; Indels 34; Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       184 AVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFK 243
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           HGAPV--GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIF 413
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       414 MGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEAFLKSKLSW 466
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             15 FKLWAPYVNSVKLKLSKKLIPMEK -----NDEGFFEVEIDDIEENLTYSYIIE-DKREI 67
              APPLICATION NUMBER: JP 59834
FILING DATE: 07-MAR-1994
PRIOR APPLICATION DATE:
APPLICATION DATE:
APPLICATION NUMBER: JP 59840
FILING DATE: 07-MAR-1994
ATTORNEY/AGENT INFORMATION:
NAME: BROWDY, ROGER L.
REGISTRATION NUMBER: 25,618
REFERENCE/DOCKET NUMBER: KUBOTA=5
TELECHOME: 202-628-5197
TELECHOME: 202-737-3528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    467 KIDEE-----VLDYYKQLINIRK 484
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            497 AEAAEGDHARLLELYRSLTALRR 519
07-MAR-1995
MBER: JP 59834
                                                                                                                                                                                                                                                    TELEX: 248633
INFORMATION FOR SEO ID NO: 4:
SEQUENCE CHARACTERISTICS:
LENGTH: 597 amino acids
TYPE: amino acid
                                                                                                                                                                                                                                                                                                                                                      TOPOLOGY: linear
MOLECULE TYPE: protein
US-08-961-240-4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ö
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ò
```

Search completed: July 15, 2002, 12:18:05 Job time: 97 sec



```
July 15, 2002, 12:18:43 ; Search time 32.43 Seconds (without alignments) 1647.415 Million cell updates/sec
                                                                                                                                                                                                   US-09-298-924-8
2954
1 MFSFGGNIEKNNGJFKLMAP.......KLKKDELIKVNRGVGVYQLE 556
                                                                                                                                                                                                                                                                                                                                                                                                283138
GenCore version 4.5
Copyright (c) 1993 - 2000 Compugen Ltd.
                                                                                                                                                                                                                                                                                                                                                                                        Total number of hits satisfying chosen parameters:
                                                                                                                                                                                                                                                                                                                                                     283138 seqs, 96089334 residues
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Post-processing: Minimum Match 0%
Maximum Match 100%
Listing first 45 summaries
                                                                              OM protein - protein search, using sw model
                                                                                                                                                                                                                                                                                        BLOSUM62
Gapop 10.0 , Gapext 0.5
                                                                                                                                                                                                                                                                                                                                                                                                                                   Minimum DB seq length: 0
Maximum DB seq length: 200000000
                                                                                                                                                                                                     Title:
Perfect score:
Sequence:
                                                                                                                                                                                                                                                                                          Scoring table:
                                                                                                                                                                                                                                                                                                                                                     Searched:
                                                                                                                     Run on:
```

Pred. No. is the number of results predicted by chance to have a score greater than or equal to the score of the result being printed, and is derived by analysis of the total score distribution. pirl:* pir2:* pir3:* pir4:* PIR_71:* Database

Description		alpha-amylase (EC	alpha-amylase (EC	_		ᇁ	maltooligosyltreha	malto-oligosyltreh	probable hydrolase				_	probable 1,4-alpha	alp		1,4-alpha-glucan b	1,4-alpha-glucan b	qlycogen operon pr	alkaline amylopull	alpha-amylase (EC	pullulanase amyX -	1,4-alpha-qlucan b	pullulanase - Ther	glycogen operon pr	alpha-amylase (EC	4-alpha-qluc	-alpha	,4-alpha-qlucan	bable
SUMMARIES		JC5132	S73087	JC5135	AH1827	JC4697	865770	JC7727	AI0673	G70763	G83375	H75516	AG3194	D96001	S19134	AH1915	B56639	S18599	S77094	E95031	G97902	G69585	S31839	H72204	S73088	S01312	S40048	E98000	G95129	E71565
DB	:																	7												
Length	1	556	561	558	620	596	598	575	594	580	583	9	595	601	552	552	999	638	707	1280	1256	718	422	843	718	562	627	642	642	999
% Query Match	1 3	100.0	60.4	59.2	41.0	32.8	32.5	31.7	30.5	29.3	29.3	28.3	26.9	26.8	16.7	16.7	11.9	11.6	11.3	11.3	11.2	11.0	10.9	10.8	10.8					10.4
Score		2954	1784.5	1748.5	1212.5	696	959	936	900.5	866.5	865.5	835.5	793.5	792.5	493	493	353	342.5	333.5	332.5	331.5	326	322.5	320	319.5	315	313.5		•	306.5
Result No.	1 1	Т	7	3	4	S	9	7	80	6	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29

241 WFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIVKDDCGYK 300

WFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIVKDDCGYK 300

241

Ω

Qy Db

Q

δ D δŽ

301 361

301 IDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPV 360

GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYYE 420

GVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHK 180

IEDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFK 120

61 61 121

ò

07 09 09

120

hype

the

```
A) Residues: 1-558 A) CROSS-references: DDBJ:D64130; NID:g987702; PIDN:BAA11010.1; PID:g1838936
A) Cross-references: DDBJ:D64130; NID:g987702; PIDN:BAA11010.1; PID:g1838936
A) Experimental source: strain KM1
C) Comment: This enzyme hydrolyzes starch alpha-1,4 linkage adjacent to the alpha-1,1
C) Superfamily: trehalose trehalohydrolase
C) Keywords: glycosidase; hydrolase
                                                                                                                                                                                                                                                                                                                                                                                               enzymes from
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              299
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      359
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    360
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  534
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   61
                                                                                                                                                                                                                                                                                                                                                 T.; Iwamatsu,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          QLINIRKRYN-NCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLI--GIGF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           SFGGNIEKNKGIFKLWAPYVNSVKLK - LSKKLIPMEKNDEGFFEVEIDDIEENLTYSYII
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    EDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFKG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             VIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       KIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                IKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFPQ
                                               SLIKIRKEYGLACNRKLSVENGNYWLTVKGNGCLAVYVFSKSVIEMKYSGTLVLSSNSSF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   GIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYW
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                FKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIV--KDDCGY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ETNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYKQL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       INIRKRYN-NCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGI--GFPK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                7;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Length 558;
                                                                                                                                                                                                                                                                                                                    Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5136
Cincession: UC5136
Cincession: UC5134: MUID:97141610
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC5135
Cincession: UC513
                                                                                                                                                                                                                                                      alpha-amylase (EC 3.2.1.1) - Sulfolobus solfataricus
C;Species: Sulfolobus solfataricus
C;Date: 31-Jan-1997 #sequence_revision 27-Feb-1997 #text_change
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   5;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                59.2%; Score 1748.5; DB 2;
llarity 58.9%; Pred. No. 6.9e-112;
Conservative 87; Mismatches 136;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              87;
                                                                                                                                        561
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                KLKKDELIKVNRGVGVYQL 555
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         541 HIEEGK-YEFDKGFALYKL 558
                                                                                             PKKLKKDELIKVNRGVGVYOL
                                                                                                                       | :: : :::| :|:|
PSQITESK-YELDKGFALYKL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Query Match
Best Local Similarity
Matches 329; Conserv
    478
                                               482
                                                                                             535
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    62
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             122
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     182
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              242
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 360
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               361
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        421
                                                                                                                                        542
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   181
                                             g
                                                                                             δ
                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       οqα
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Db
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Dp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               s,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               genome:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              to the EMBL Data Library, September 1996
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Penny,
                                                                                                                                                                                                                                                                                                                                                                                   Alpha-maylase (EC 3.2.1.1) precursor - Sulfolobus solfataricus
N.Alternate names: protein c0620
C.Species: Sulfolobus solfataricus
C.Species: Sulfolobus solfataricus
C.Species: Sulfolobus solfataricus
C.Species: O9-Oct-1997 #sequence_revision 24-Oct-1997 #text_change 20-Jun-2000
C.Accession: S73087
R.Sensen, C.W., Klenk, H.P.; Singh, R.K.; Allard, G.; Chan, C.C.Y.; Liu, Q.Y.; Pe
N.Antile: Organizational characteristics and information content of an archaeal ge
A.Title: Organizational characteristics and information content of an archaeal ge
A.Tatle: Organizational characteristics and information content of an archaeal ge
A.Accession: S73087
A.Accession: S73087
A.Status: nucleic acid sequence not shown; translation not shown
A.Molecule type: DNA
A.Residues: 1-561 c.SEN>
A.Cross-references: EMBL:V08256; NID:g1707679; PIDN:CAA69503.1; PID:g1707699
A.Experimental source: strain P2
A.Mote: the nucleotide sequence was submitted to the EMBL Data Library, September C.Superfamily: trehalose trehalohydrolase
C.Keywords: glycosidase; hydrolase
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ·
9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          G.; Chan, C.C.Y.; Liu, Q.Y.;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             an archaeal
                                                                                                                                        540
GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYYE 420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             EDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKI--EDLIIYELHVGTFSQEGNF 119
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      KGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAH 179
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            297
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     357
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                417
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      477
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   481
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  361
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       TNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYKQLI
                                                                                                                                      NIRKRYNNCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGIGFPRKLKK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  SFGGNIEKNKGIPKLWAPYVNSVKLK-LSKKLIPMEKNDEGFFEVEIDDIEENLTYSYII
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           KRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    GYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      YYETNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          6
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Length 561;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              5;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          60.4%; Score 1784.5; DB 2; 59.2%; Pred. No. 2.4e-114; ive 90; Mismatches 130;
                                                                                                                                                                                                                                 DELIKVNRGVGVYQLE 556
                                                                                                                                                                                                                                                         Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Query Match
Best Local Similarity
Matches 332; Conserv
  361
                                                                                        421
                                                                                                                                      481
                                                                                                                                                                                   481
                                                                                                                                                                                                                                 541
                                                                                                                                                                                                                                                                         541
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             62
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               122
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     298
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                358
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        362
                                             421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 422
g
                                                                                        8
                                                                                                                                                                            qq
                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                     a
                                           ò
                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          요
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     QΩ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                οŻ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ò
```

5

 \sim

ž

sb.

produci

```
565770
maltooligosyltrehalose trehalohydrolase - Arthrobacter sp. (strain Q36)
c; Species: Arthrobacter sp.
A; Variety: strain Q36
c; Date: 28-Oct-1996 #sequence_revision 13-Mar-1997 #text_change 20-Jun-2000
c; Date: 28-Oct-1996 #sequence_revision 13-Mar-1997 #text_change 20-Jun-2000
c; Date: 28-Oct-1996 #sequence_revision 13-Mar-1997 #text_change 20-Jun-2000
R; Maruta K.; Hattori, K.; Nakada, T.; Kubota, M.; Sugimoto, T.; Kurimoto, M.
Biochim. Biophys. Acta 1289, 10-13, 1996
A; Title: Cloning and sequencing of trehalose biosynthesis genes from Arthrobacter sp
A; Reference number: S65769; MUID: 96195835
A; Status: preliminary
             A,Title: Cloning and sequencing of trehalose biosynthesis genes from Rhizobium s A;Reference number: JC4696; MUID:96219094
A;Reference number: JC4696; MUID:96219094
A;Recasion: JC4697
A;Molecule type: DNA
A;Residues: 1-596 <AMAR>
A;Residues: 1-596 <AMAR>
A;Cross-references: DDBJ:D78001; NID:91040695; PIDN:BAA11187.1; PID:91040697
C;Comment: This enzyme belongs to the alpha-amylase family. It hydrolyzes the pi c;Genetics:
C;Genetics:
C;Genetics: A;Genetics: C;Genetics: C;Genetics: C;Genetics: C;Genetics: C;Genetics: C;Genetics: C;Genetics: C;Genetics: C;Genetics: A;Genetics: C;Cyperfamily: trehalose trehalohydrolase
C;Keywords: 91ycosyltransferase; hexosyltransferase
                                                                                                                                                                                                                                                                                                                                                                                                                                                12;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ---IIYELHVGTFSQ 115
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  :||| :| || ||| || || || || || : :|
PLPDPRTRRQPEGVH---ALSRT----FDPGAHRWQDAGWGGRELQGSVIYELHIGTFTP 127
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      EGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLV 175
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      289
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              347
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  348 YSRYRGRIHGAPV--GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            427
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEA 458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   487
                                                                                                                                                                                                                                                                                                                                                                                                                                                Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 15 GRFDIWAPEAGTVTLLAGGERYEMGRRPGNGPADEGWWTAADAPTGADVDYGYLLDGDEI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              GIFKLWAPYVNSVKLKLSKKLIPMEKN-----DEGFFEVEIDDIEENLTYSYIIE-DKR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             NEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFIL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ENVEYWFRTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGK-----FVIAESDLND
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       290 PKIV--KDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         FLKSKLSWK-----IDEEVLDYYKQLINIRKRYNNCKRVKEVRREGNCITLIMEKIGIIA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Length 596;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               EIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDL----
                                                                                                                                                                                                                                                                                                                                                                                       32.8%; Score 969; DB 2; 39.5%; Pred. No. 1.6e-58; tive 74; Mismatches 195;
                                                                                                                                                                                                                                                                                Superfamily: trehalose trehalohydrolase Keywords: glycosyltransferase, hexosyltransferase
Biotechnol. Biochem. 60, 717-720, 1996
                                                                                                                                                                                                                                                                                                                                                                                                                                           Conservative
                                                                                                                                                                                                                                                                                                                                                                                                             Local Similarity
nes 215; Conserve
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          517
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        537
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           EFDD
                                                                                                                                                                                                                                                                                                                                                                                       Query Match
Best Local S:
Matches 215
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          SFDD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           13
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         128
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             176
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             188
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 236
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    248
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        308
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               406
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   459
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        534
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ΩŽ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Db
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      δŽ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               δŽ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ٥y
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   q
                                                                                 alpha-amylase [imported] - Anabaena sp. (strain PCC 7120)
C; Species: Anabaena sp.
A; Note: Anabaena sp.
A; Note: Anabaena sp.
A; Note: Anabaena sp.
C; Date: 14-Dec-2001; sequence_revision 14-Dec-2001 #text_change 11-Jan-2002
C; Accession: AH1827
R; Kanako, T.; NaKamura, Y; Wolk, C.P.; Kuritz, T.; Sasamoto, S.; Watanabe, A.; Iriguchi Nakazaki, N.; Shimpo, S.; Sugimoto, M.; Takazawa, M.; Yamada, M.; Yasuda, M.; Tabata, S DNA Res. 8, 205-213, 2001
A; Title: Complete Genomic Sequence of the Filamentous Nitrogen-fixing Cyanobacterium Ana A; Reference number: AB1807; MUD: 21595285; PMID: 11759840
A; Reference number: AB1807; MUD: 21595285; PMID: 11759840
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residues: 1-620 < RURA
A; Residue
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   7;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               C;Species: Rhizobium sp.
C;Species: Rhizobium sp.
C;Date: 10-May-1996 #sequence_revision 19-Jul-1996 #text_change 20-Jun-2000
C;Accession: JC4697
R;Maruta, K.; Hattori, K.; Nakada, T.; Kubota, M.; Sugimoto, T.; Kurimoto, M.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              SRYQPLGVHDKSQLIRTDYQILD--LGKVKIEDLIIYELHVGTFSQEGNFKGVIEKLDYL 129
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            KDLGITGIELMPVAQFPGN-----RDWGYDGVFLYAVQNTYGGPWELAKLVNEAHK 180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   181 RGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEY 240
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    WFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLG-----KFVIAESDLNDPKIVK 294
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           --DDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYR 352
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               GRIHGAPVGDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLI 412
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     FMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKE-----NNQMIDPQSEEAFLKSKLSW 466
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  FKLWAPYVNSVK---LKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYIIEDKREIPDPA 71
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   33;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Length 620;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ; Score 1212.5; DB 2;
; Pred. No. 3.7e-75;
86; Mismatches 151; ]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      trehalose trehalohydrolase (EC 2.4.1.-) - Rhizobium sp.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          :: : : : |:|:||| :: | : ELRHQGQHKVLWDWYRQLIHLRKTH 533
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         KIDEE----VLDYYKQLINIRKRY 486
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             41.0%;
46.5%;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Best_Local Similarity 46.5*
Matches 235; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    15
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           83
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               130
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               149
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        72
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       269
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        295
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 353
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      449
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         467
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             509
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Š
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
```

Pred. No. 2.8e-56;

4

```
Best Local Similarity 38.7
Matches 198; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     C; Genetics
                                                                                                                                                                                                                                                                                                                       235
                                                                                                                                                                                                                                                                                                                                                                                                                       292
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     90
                                                                                                                                                                                                                                                                                                                                                                                      289
                                                                                                                                                                                                                                                                                                                                                                                                                                                     347
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     412
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   472
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 15
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                22
                                                                                                                                                   g
                                                      δ
                                                                                     g
                                                                                                                    ò
                                                                                                                                                                                     δ
                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                       δλ
                                                                                                                                                                                                                                                                                                                                                QQ
                                                                                                                                                                                                                                                                                                                                                                                    δy
                                                                                                                                                                                                                                                                                                                                                                                                                   q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               q
                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        malto-oligosyltrehalose trehalohydrolase (BC 3.2.1.141) - Arthrobacter ramosus C; Species: Arthrobacter ramosus C; Species: Arthrobacter ramosus C; Species: Arthrobacter ramosus C; Species: Arthrobacter ramosus C; Species: Arthrobacter ramosus C; Stecession: JC7727; PC715; BC715; PC715; BC715; PC715; BC715; PC715; BC715; PC715; Biochem. 65, 1419-1423, 2001
A; Title: Trehalose-producing operon treyz from Arthrobacter ramosus S34.
A; Reference number: JC7727
A; Molecule type: DNA
A; Residues: 1-575 AYAM
A; Residues: 1-575 AYAM
A; Residues: 1-575 AYAM
A; Residues: 1-575 AYAM
A; Residues: 1-575 AYAM
A; Residues: 1-20:31-50; 298-319 AYA>
C; Comment: This enzyme is involved in producing trehalose from glycogen.
C; Genetics:
A; Genetics:
A; Genetics:
C; Superfamily: trehalose trehalohydrolase
C; Keywords: glycosidase; hydrolase
                                                                                                                                     10;
A;Molecule type: DNA
A;Residues: 1-598 <MAR>
A;Cross-references: EMBL:D63343; NID:g1255444; PIDN:BAA09668.1; PID:g1255446
C;Superfamily: trehalose trehalohydrolase
                                                                                                                                                                                                                                                       198 GVIQDVVYNHLGPSGNYLPRFGPYLKQGEGNTWGDSVNLDGPGSDHVRRYILDNLAMMLR 257
                                                                                                                                                                                                                                                                                                                                                                                                                                                          258 DYRVDGLRLDAVHALKDERAVHILLEDFGALADQISAEVGRPLTLIAESDLNNPRLLYPRD 317
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     124 EKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGI 183
                                                                                                                                                                                                                                                                                                                       184 AVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFK 243
                                                                                                                                                                                                                                                                                                                                                                                                                                    TFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFV----IAESDLNDPKIV--KD 295
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   DCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRT 355
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   HGAPV--GDLPPRKFVVFIQNHDQVGNRGNERLSILTDKTTYLMAATLYILSPYIPLIF 413
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  414 MGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEAFLKSKLSW 466
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   PDPASRYQPLGVHDKSQLI-RTDYQILD---LGKVKIEDLIIYELHVGTFSQEGNFKGVI 123
                                                                                                                                       Gaps
                                                                                                                                                                                        15 FKLWAPYVNSVKLKLSKKLIPMEK-----NDEGFFEVEIDDIEENLTYSYIIE-DKREI 67
                                                                                                                                       34;
                                                                                                    Length 598
                                                                                                 32.5%; Score 959; DB 2; Length 59
40.2%; Pred. No. 7.8e-58;
.ive 81; Mismatches 186; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | :|: |: |: |: AEAAEGDHARLLELYRSLTALRR 520
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 KIDEE-----VLDYYKQLINIRK 484
                                                                                                   Query Match
Best Local Similarity 40.2%
Matches 202; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Superfamily: trehalose
Keywords: glycosidase;
                                                                                                                                                                                                                                   68
                                                                                                                                                                                                                                                                   79
                                                                                                                                                                                                                                                                                                                                                                                                                                    244
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  296
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 356
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               438
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 467
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                498
                                                                                                                                                                     ð
                                                                                                                                                                                                 a
                                                                                                                                                                                                                                   ŏ
                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
```

Length 575;

DB 2;

31.7%; Score 936;

Query Match

```
probable hydrolase STY1503 [imported] - Salmonella enterica subsp. enterica serovar Tprobable hydrolase STY1503 [imported] - Salmonella enterica serovar Typhi
A:Note: this species has also been called Salmonella typhi
C:Date: 09-Nov-2001 #sequence_revision 09-Nov-2001 #text_change 27-Nov-2001
C:Accession: A10673
R:Parkhill, J: Dougan, G:; James, K.D.; Thomson, N.R.; Pickard, D.; Wain, J.; Church
th, T.; Connerton, P.; Cronin, A.; Davis, P.; Davies, R.M.; Dowd, L.; White, N.; Farr
S: Moule, S: O'Gara, P.
Nature 413, 848-852, 2001
A:Authors: Parry, C.; Quail, M.; Rutherford, K.; Simmonds, M.; Skelton, J.; Stevens,
A:Title: Complete genome sequence of a multiple drug resistant Salmonella enterica se
A:Reference number: AB0502; PMID:11677608
                                             10;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      13;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    A;Status: preliminary
A;Molecule type: DNA
A;Residues: 1.594 <PAR>
A;Cross-references: GB:AL513382; PIDN:CAD01762.1; PID:g16502610; GSPDB:GN00176
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             -KIEDLIIYELHVGTFS 114
                                                                                                                                                                                                                                               65 RSLRQPRGVH------ELGREFDPARYAWGDDGWRGRDLTGAVIYELHVGTFT 111
                                                                                                                                                                                                                                                                                                      115 QEGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKL 174
                                                                                                                                                                                                                                                                                                                                 175 VNEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFI 234
                                                                                                                                                                                                                                                                                                                                                                                                                                   LENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIA----EKAHQLGK--FVIAESDLN 288
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        KYSRYRGRTHGAPVG-DLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM------IDPQSEEA 458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        QPLGVHDKSQLIRTDYQILDLGKV------KIEDLIIYELHVGTFSQEGNFKGVIE 124
                                                                                            15 FKLWAPYVNSVKLKL--SKKLIPMEKNDEGFFEVE--IDDIEENLTYSYIIEDKREIPDP 70
                                                                                                                                               64
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      FKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYIIEDKREIPDPASRY 74
                                                                                                                                            5 FPVWAPQAAQVILVVGQGRAELPLIRDENGWWALQQPWDGGPDLVDYGYLVDGKGPFADP
                                               54;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      61;
                                               Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Length
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Indels
                                          177;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              30.5%; Score 900.5; DB 2;
38.9%; Pred. No. 7.8e-54;
Live 79; Mismatches 173;
                                               Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    459 FLKSKLSWKIDEE-----VLDYYKQLINIRK 484
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               A,Gene: STY1503
C,Superfamily: trehalose trehalohydrolase
                                                                                                                                                                                               71 ASRYQPLGVHDKSQLIRTDYQILDLGKV--
38.78; Fig. 82;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Query Match
Best Local Similarity
Matches 199; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        75
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
```

us-09-298-924-8.rpr

qq		:: :
Qy	125 KLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIA 184 : : : : : :	QY 245 FKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIVKDD 296
Oy Db	185 VILDVVYNHIGPEGNYLLGLGP-YFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFK 243	QY 297 CGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTH 356
Qy	244 TFKIDGLRLDAVHAIFDNSPKHILQETAEKAHQLGKFVIAESDLNDPKI 292 :	QY 357 GAPVGDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLXILSPYIPLIFM 414
Qy Dp	293VKDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYD 345 303 SLHPRDQDGNAPLFTAEWNDDFHNAVHVFATGETQAYYNDFADAPEKHLARALABGFAYQ 362	QY 415 GEEYYETUPFFFFSDPVLIKGVREGRLKENUQMIDPQSEEAFLKSKLSWK 467
Qy Db	346 GKYSRYRGRTHGAPVGDLPPRKFVVFIQNHDQVGNRGNGERLSILID-KTTYLMAATLYI 404 :	Qy 468IDBEVLDYXKQLINIR 483 bb 479 EAGSGEHARLHRFYRDLIAIR 499
O _Y	405 LSPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAF 459 : : : : : :	RESULT 10 G83375
O _Y	460 LKSKLSWKIDEEVLDYYKQLINIRRRY 486 	probable glycosyl hydrolase PA2164 [imported] - Pseudomonas aeruginosa (strain PAO1) C;Species: Pseudomonas aeruginosa C;Date: 15-Sep-2000 #sequence_revision 15-Sep-2000 #text_change 31-Dec-2000 C;Accession: G83375
RESULT G70763 probab]	RESULT 9 G70763 probable maltooligosyltrehalose trehalohydrolase - Mycobacterium tuberculosis (strain H3	R;Stover, C.K.; Pham, X.Q.; Erwin, A.L.; Mizoguchi, S.D.; Warrener, P.; Hickey, M.J.; adman, S.; Yuan, Y.; Brody, L.L.; Coulter, S.N.; Folger, K.R.; Kas, A.; Larbig, K.; L.; Lory, S.; Olson, M.V. Nature 406, 959-964, 2000 A;Title: Complete genome sequence of Pseudomonas aeruginosa PA01, an opportunistic pa
7; S S S S S S S S S S S S S S S S S S S	C;Species: Mycobacterium tuberculosis C;Date: 17-Jul-1998 #sequence_revision 17-Jul-1998 #text_change 20-Jun-2000 C;Accession: G70763 R;Colde, S.T.; Brosch, R.; Parkhill, J.; Garnier, T.; Churcher, C.; Harris, D.; Gordon, S.; Connor, R.; Davies, R.; Devlin, K.; Feltwell, T.; Gentles, S.; Hamlin, N.; Holrovd, S.	A; Neterace number: A82950; MOID:20437337 A; Accession: G83375 A; Moteun: preliminary A; Moteune: Type: DNA A; Residues: 1-583 <sto></sto>
Raje Natu A; Au A; Ti	S	A;Cross-references: GB:AE004643; GB:AE004091; NID:g9948178; PIDN:AAG05552.1; GSPDB:GN A;Experimental source: strain PA01 C;Generics: A;Gene: PA2164
A; R¢ A; Ac A; St	ference number: A70500; MUID:98295987 cession: G70763 atus: preliminary; nucleic acid sequence not shown, translation not shown	C;Superfamily: trehalose trehalohydrolase
A; Mc A; Re A; Cr A; Ex	lecule type: DNA sidues: 1-580 <col/> oss-references: GB:Z74020; GB:AL123456; NID:g3261584; PIDN:CAA98329.1; PID:g1403480 perimental source: strain H37Rv	Query Match 29.3%; Score 865.5; DB 2; Length 583; Best Local Similarity 38.2%; Pred. No. 1.9e.51; Matches 199; Conservative 89; Mismatches 166; Indels 67; Gaps 20;
C; Ge A; Ge C; Su	C;Genetics: A;Gene: g1g2 C;Superfamily: trehalose trehalohydrolase	QY 4 FGGNIEKN-KGIFKLWAPYVNSVKLKLSK-KLIPMEKNDEGFFEVEIDDIEENLTYSYII 61
Qu Be	Query Match 29.3%; Score 866.5; DB 2; Length 580; 37.3%; Pred. No. 1.6e-51; Matches 187. Concervative 93. Mismatches 187. Concervative 93. Mismatches 187. Concervative 188.	QY 62 EDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIVELHVG 111 ::: :
Vo 4	FKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVELDDIEENLTYSYIIEDKREI-PDPASR 73	QY 112 TFSQEGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGYFLYAVQNTYGGPWEL 171 :
0 o	FKVWAFNFALVKLIJVNOAVHAMITSALJOWWHIIY - AAFALJAKIGILLDDDDFIYLFDPRSA YQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFKGVIE	QY 172 AKLVNEAHRRGIAVILDVVXNHIGPEGNYLLG-LGPYFSDRYKTPWGLTFNFDDRGCDQV 230
8 6 1	KLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIA	QY 231 RKFILENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAES 285 : :::
o vo	120 ALDZEVPLGIDEVELMPVNSFRGTRGWGYDGVLWYSVHEPYGGPDGLVRFIDACHARREG 179 185 VILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKT 244	QY 286 DLNDPKIVKDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGR-IEDIEKTFKDVFVY 344 :::

290	Db 450 FFSDHAGE-LGQAVSEGRKKEFGGFSGFSGEDVPDPQAEQTFLNSKLNWAEREGGEHART 508
OY 345 DGKYSKRKRHGAPUGDLPPRKFVVFIONHDQVONRGNGENESILTDKTTYLMAATLYI 404 1; -i; -ii i i i i i i i i i	OY 473 LDYYKOLINIRK 484 DD 509 LRIYRDILRIRR 5.0
OY 405 LSPYIPLIFMGEBYYETNPFFFESDPYLIKGYREGRLKENNQMID 452	SULT
453 PQSEBAFLKSKLSWKIDBEVLDYYKQLINIRKRY 486 : : : : :	Ad31194 alpha-amylase Atu5284 [imported] - Agrobacterium tumefaciens (strain C58, Dupont) pla C;Species: Agrobacterium tumefaciens C;Date: 11-Jan-2002 #sequence_revision 11-Jan-2002 #text_change 01-Feb-2002
SULT 11	C;ACCESSION: AG3194 R;Wood, D.W.; Setubal, J.C.; Kaul, R.; Monks, D.; Chen, L.; Wood, G.E.; Chen, Y.; Woo erage G.; Gillet, W.; Grant, C.; Guenthner, D.; Kutyavin, T.; Levy, R.; Li, M.; McCl; Karp, P.; Romero, P.; Zhang, S.
H7310 Probable maltooligosyltrehalose trehalohydrolase - Deinococcus radiodurans (strain R1) C;Species: Deinococcus radiodurans	Science 294, 2317-2323, 2001 A.Authors: Yoo, H.; Tao, Y.; Biddle, P.; Jung, M.; Krespan, W.; Perry, M.; Gordon-Kam ster. E.W.
sc-1999 #text_change 17-Mar-2000	A.Title: The Genome of the Natural Genetic Engineer Agrobacterium tumefaciens C58. A.Reference number: AB2577; PMID:11743193
<pre>K. Willich O. ; bisen, J.A.; Heidelberg, J.F.; Hickey, E.K.; Peterson, J.D.; Dodson, R.J.; W.; Shen, M.; Vamathevan, J.J.; Lam, P.; McDonald, L.; Utterback, T.; Zalewski, C.; Ma S.; Smith, H.O.; Venter, J.C.; Fraser, C.M.</pre>	A;Accession: AG3194 A;Status: preliminary A;Molecule type: DNA
Science 28b, 15/1-15/7, 1999 A; Title: Genome sequence of the radioresistant bacterium Deinococcus radiodurans R1. A; Reference number: A75250; MUID:20036896	A; Residues: 1-595 <kur> A; Cross-references: GB: AE008687; PIDN: AAL45973.1; PID: 917743726; GSPDB: GN00188 A; Experimental source: strain C58 (Dupont)</kur>
	C;Genetics: A/Gene: Atu5284 A:Genome: nlasmid
A.Residues: 1-600 <whi>> X.Cross-references: GB.BE001905; GB.BE000513; NID:96458144; PIDN:AAF10042.1; PID:9645814 A.Experimental source: etrain pl</whi>	C; Superfamily: trehalose trehalohydrolase
	Query Match 26.9%; Score 793.5; DB 2; Length 595;
A;Map position: 1 C;Superfamily: trehalose trehalohydrolase	IMITALIY ; Conservat
cal Similarity 36.8%; Pred. No. 2.2e-49;	Db 22 FSIWAPASATVKLWLNDAEFDMHTAGDGWHDITKPALPGD-RYGFVLADRTRVADPASNR 80
Matches 181; Conservative 89; Mismatches 191; Indels 31; Gaps 12; Qy 15 FKLWAPYVNSVKLKLSKKLIPMEKNDEGFPEVEIDDIEENLTYSYIIEDKREIDDPASRY 74	Qy 75 QPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFKGVIEKLDYLKD 131
	132
75 QPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFKGVIEKLDYLKD	
96	Qy 192 NHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKTFKIDGLR 251
QY 132 LGITGIELMPVAQFPGNEDWGYELXAVQNTYGGPWELAKLVNEAHKRGIAVILLDVYX 191 1 1 1 1 1 1 1 1 1	200 NHFGPAGNTLQAXAPAFFKKHETPWGPAPDFNRAEVRSFFLQNAFYWLETYRFDGLR
192	VY ZOZ LUAV HAIFUNSPKHILÖEIAKRANDEGKFVTRESDLNDPKIVKDDCGYKIDAQ 304
Db 216 NHFGPSGNYLSSYAPSYFTDRFSSAWGMGLDYAEPHWRRYTGNARWWLRDYHFDGL 272 Qy 251 RLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIVKDDCGYKIDAGWVDD 308	QY 305 WVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRG-RTHGAPVG 361
273 RLDATPYMTDDSETHILTELAQEIHELGGTHLLLAEDHRNLPDLVTVNHLDGIWTDD	
OY SUS FINANCHARITAEANITYOUR-GALEDIEKTEKUNEVYEGKYSRYRGRTHGAPVGDLPP 365	ŭ.
426	RESULT 13 D96001 probable 1,4-alpha-glucan branching enzyme (EC 2.4.1.18) [imported] - Sinorhizobium m

from the cyanobacterium Anaba

26;

Gaps

16.7%; Score 493; DB 2; Length 552; 28.6%; Pred. No. 5.3e-26; .ive 76; Mismatches 142; Indels 178;

99 64

205 240

--GPEGNYLLGLG

```
C;Species: Anabaena variabilis
C;Date: 13-Jan-1995 #sequence_revision 13-Jan-1995 #text_change 17-Mar-2000
C;Accession: S19134
E;Sato, N.
Plant Mol. Biol. 18, 165-170, 1992
A;Title: Cloning of a low-temperature-induced gene lti2 from the cyanobacter A;Reference number: S19133; MUID: 92119230
A;Reference number: S19134
A;Recession: S19134
A;Status: preliminary
A;Molecule type: DA
A;Resduces: 1-552 <AAP>
A;Resduces: 1-552 <AAP>
A;Resduces: EMBL:X59279; NID:q39252; PIDN:CAA41970.1; PID:q39253
C;Superfamily: neopullulanase; alpha-amylase core homology
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         67 QWVDVTDPYATDIDESSGKDNSIARIKDGEKIVDTYVWQHDDKPLPADHELVIYELHVGD 126
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            65 R--EIPDPASR--YQPLGVHDKSQLIRTDYQILDLGKVKIED------LIIYELHVGT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           FKLWAPYVNSVKLKLS----KKLIPMEKNDEGFFE--VEIDDIEENL----TYSYIIEDK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                113 FS-----QEGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         GGPWELAKLVNEAHKRGIAVILDVVYNHI-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Query Match 16.79
Best Local Similarity 28.69
Matches 159; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      474
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       452
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             15
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           206
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  166
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     291
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ôγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                                                                 A; Molecule type: DNA
A; Residues: 1-601 < KURS
A; Residues: 1-601 < KURS
A; Residues: 1-601 < KURS
A; Residues: 1-601 < KURS
A; Residues: 1-601 < KURS
A; Residues: 1-601 < KURS
A; Residues: 1-601 < KURS
A; Residues: 1-601 < KURS
A; Residues: 1-601 < KURS
A; Residues: 1-601 < KURS
A; Residues: 1-601 < KURS
A; Residues: 1-601 < KURS
A; Residues: 1-601 < KURS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < KuRS
A; Residues: 1-601 < K
                                                                                                                                                                                                                endd
                                                                                                                                   Herna
                                              C;Date: 24-Aug-2001 #sequence_revision 24-Aug-2001 #text_change 14-Sep-2001 C;Accession: D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D9601 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D96001 p. D9600
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              15;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            62 EDKREIPDPASRYQPLGVHDKSQLI---RTDYQILDLGKVKIEDLIIYELHVGTFSQEGN 118
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           119 FKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEA 178
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               179 HKRGIAVILDVVYNHIGPEGNYLLGLGP-YFSDRYKTPWGLTFNFDDRGCDQVRKFILEN 237
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 238 VEYWFKTFKIDGLRLDAVHAIFDNSPKHIL----QEIAEK-AHQLGKFVIAESDLNDPKI 292
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      VKDDCGYKI -- DAQWVDDFHHAVHAFITKEKDYYYQDF----GRIEDIEKTFKDVFVYD 345
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         346 GKYSRYRGRTHGAPVGD---LPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATL 402
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      3 SFGGN-IEKNKGIFKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYII 61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Length 601;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         403 YILSPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRL------
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  451 IDPOSEEAFLKSKLSWK----IDEEVLDYYKQLINIRKRY 486
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 26.8%; Score 792.5; DB 2; 36.9%; Pred. No. 1.9e-46; iive 79; Mismatches 199;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Keywords: glycosyltransferase; hexosyltransferase
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Superfamily: trehalose trehalohydrolase
                 C; Species: Sinorhizobium meliloti
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Query Match
Best Local Similarity
Matches 192; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               A; Gene: glgB2; SMb21447
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     A;Genome: plasmid
C;Superfamily: tre
C;Keywords: glycos
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      293
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   479
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           음
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Dp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   õ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ç
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
```

```
hypothetical protein al10875 [imported] - Anabaena sp. (strain PCC 7120)

hypothetical protein al10875 [imported] - Anabaena sp. (strain PCC 7120)

4; Note: Anabaena sp. (strain PCC 7120) is a synonym of Nostoc sp. strain PCC 7120

6; Date: 14-Dec-2001 #sequence_revision 14-Dec-2001 #text_change 11-Jan-2002

6; Accession: AH1915

8; Kaneko, T.; Nakamura, Y.; Wolk, C.P.; Kuritz, T.; Sasamoto, S.; Watanabe, A.; Irigu Nakazaki, N.; Shimpo, S.; Sugimoto, M.; Takazawa, M.; Yamada, M.; Yasuda, M.; Tabata DNA Res. 8, 205-213, 2001

A; Fille Complete Genomic Sequence of the Filamentous Nitrogen-fixing Cyanobacterium A; Reference number: AB1807; MUID:21595285; PMID:11759840
                                                                           290
                                                                                                                                                      312
                                                                                                                                                                                                    418
PYFSDRYKTPWGLTFNFD--DRGCD--QVRKFILENVEYWFKTFKIDGLRLDAVHAIFDN 261
                                                                                                                                                                                                                                                                                                                 313 VHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPVGDLPPRKFVVFI 372
                                                                                                                                                                                                                                                                                                                                                                                                341 IKAHIC------GDTFDLE-NLKDVI--DPKRQGFLGATN-------VVNYL 376
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           424
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           419 YETINPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSW-----KIDEEVL 473
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      -----SKIDWTLLGNDLNRSLF 451
                                                                                                                                                      262 SPKH-ILQEIAEKAHQLGKFVIAE -----SDLNDPKIVKDDCGYKIDAQWVDDFHHA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           377 INHDHDHIMVELGNR-----EIFHDEAFRRAKLGTAILMTAV-----GVPLIWMGEEF
                                                                           ------WGPEFNYEHYDENLETYPARKFIGDTVRYWVGEYHLDGIRYDAARQIANY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                            373 QNHD-----QVGNRGNGERLSILTDK-----TTYLMAATLYILSPYIPLIFMGEEY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              425 GEYKP-----KQQDQ---
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              488
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ||:| || :|| ||
|DYHKGLIGLRK--NN 464
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              DYYKQLINIRKRYNN
```

probable alpha-glucanotransferase - Anabaena variabilis

14

RESULT S19134

A;Status: preliminary

```
26;
A; Molecule type: DNA
A; Residues: 1-552 < KURA
A; Residues: 1-552 < KURA
A; Cross-references: GB:BA000019; PIDN:BAB72832.1; PID:g17130220; GSPDB:GN00179
A; Experimental source: strain PCC 7120
C; Genetics:
C; Genetics:
C; Superfamily: neopullulanase; alpha-amylase core homology
                                                                                                                                                                                                                                                                                                                                                                                                                          67 QWVDVTDPYATDIDESSGKDNSIARIKDGEKIVDTYVWQHDDKPLPADHELVIYELHYGD 126
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                241 ------WGPEFNYEHYDENLETYPARKFIGDTVRYWVGEYHLDGIRYDAARQIANY 290
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                262 SPKH-ILQEIAEKAHQLGKFVIAE-----SDLNDPKIVKDDCGYKIDAQWVDDFHHA 312
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 291 DFMHWIAQEAKKTAGAKPFYNVAEHIPETTSIINLDGP-------MDGCWHDSFYHT 340
                                                                                                                                                                                                                                                                                                                                                                                             R--EIPDPASR--YQPLGVHDKSQLIRTDYQILDLGKVKIED------LIIYELHVGT 112
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     113 FS-----QEGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTY 165
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              166 GGPWELAKLVNEAHKRGIAVILDVVYNHI---------GPEGNYLLGLG 205
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         206 PYFSDRYKTPWGLTFNFD--DRGCD--QVRKFILENVEYWFKTFKIDGLRLDAVHAIFDN 261
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           313 VHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPVGDLPPRKFVVFI 372
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      341 IKAHIC------GDTFDLE-NLKDVI--DPKRQGFLGAIN-------VVNYL 376
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      373 QNHD-----QVGNRGNGERLSILTDK-----TTYLMAATLYILSPYIPLIFMGEEY 418
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               377 TNHDHDHIMVELGNR-----EIFHDEAFRRAKLGTAILMTAV-----GVPLIWMGEEF 424
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               419 YETNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSW-----KIDEEVL 473
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ----KQODQ------SKIDWTLLGNDLNRSLF 451
                                                                                                                                                                                                    Ouery Match 16.7%; Score 493; DB 2; Length 552; Best Local Similarity 28.6%; Pred. No. 5.3e-26; Matches 159; Conservative 76; Mismatches 142; Indels 178; Gaps
                                                                                                                                                                                                                                                                                               15 FKLWAPYVNSVKLKLS---KKLIPMEKNDEGFFE--VEIDDIEENL--'--TYSYIIEDK 64
                                                                                                                                                                                                                                                                                                                                 425 GEYKP------
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     474 DYYKQLINIRKRYNN 488
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ||:| || :|| ||
|DYHKGLIGLRK--NN 464
                                                                                                                                                                                                                                                                                                                                                                                             65
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  452
                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ద
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            à
```

Search completed: July 15, 2002, 12:18:44 Job time: 136 sec bacillus apparamys (m aspergillus aspergillus aspergillus traptococc bacillus ac escherichia aspergillus flavobacter

P38939 P29093 P29093 Q08047 Q02059 Q02050 Q02751 Q54796 P32818 P32818 P307962 P307962 P307962 P307962 P307962 P307962 P307962 P30898

APU_THEET
0116_BACSP
0166_BACSP
0166_BATZE
AMYA_ASPAW
AMYB_ASPAW
AMYB_ASPAW
MALT_CANAL
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
DEXB_STRRN
D

1481 7098 7099 4999 7099 7099 7099 7099

00000000000000

233.5 223.3 222.8 222.5 2225.5 225.5 225.5 224.5 223.5 223.5

```
(without alignments)
1118.923 Million cell updates/sec
                                                                                                                                                                US-09-298-924-8
2954
1 MFSFGGNIEKNKGIFKLWAP......KLKKDELIKVNRGVGVYQLE
                                                                                             July 15, 2002, 12:24:32; Search time 19.24 Seconds
                 Compugen Ltd
                                                                                                                                                                                                                                                                                                                      of hits satisfying chosen parameters:
GenCore version 4.5
Copyright (c) 1993 - 2000 Comp
                                                                                                                                                                                                                                                                                       105224 seqs, 38719550 residues
                                                                                                                                                                                                                                                                                                                                                                                                        Post-processing: Minimum Match 0%
Maximum Match 100%
Listing first 45 summaries
                                                                 protein search, using sw model
                                                                                                                                                                                                                                     BLOSUM62
Gapop 10.0 , Gapext
                                                                                                                                                                                                                                                                                                                                                          length: 0
length: 2000000000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              SwissProt_40:*
                                                                                                                                                                  Title:
Perfect score:
Sequence:
                                                                                                                                                                                                                                                                                                                                                    Minimum DB seq
Maximum DB seq
                                                                                                                                                                                                                                       Scoring table:
                                                                                                                                                                                                                                                                                                                        Potal number
                                                                 protein
                                                                                                                                                                                                                                                                                       Searched:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Database
                                                                                                  on:
                                                                                                  Run
                                                                 ĕ
```

Pred. No. is the number of results predicted by chance to have a score greater than or equal to the score of the result being printed, and is derived by analysis of the total score distribution. SUMMARIES

RESULT 1
TREZ_RHISP STANDARD; PRT; 596 AA.

C 53238,
DT 16-OCT-2001 (Rel. 40, Last sequence update)
DT 16-OCT-2001 (Rel. 40, Last amountation update)
DF 16-OCT-2001 (Rel. 40, Last amountation update)
DF Malto-oligosyltrehalose trehalohydrolase (EC 3.2.1.141) (WTHase) (4DE alpha-D-{(1->4)-alpha-D-glucano}trehalose trehalohydrolase)

ALIGNMENTS

Q53238 rhizobium s
Q44316 arthrobacte
O59500 brevibacter
O50550 brevibacter
O10769 mycobacteri
P30537 bacillus ac
P30538 bacillus se
P30538 bacillus se
P52980 streptomyce
P52981 synechocyst
P52981 synechocyst
P52981 synechocyst
P52981 synechocyst
P52981 synechocyst
P5299 agrobacteri
C10625 mycobacteri
P6297 agrobacteri
P6297 agrobacteri
P6297 agrobacteri
P6297 agrobacteri
P6297 bacillus me
P16954 synechococc
P1489 dictycylomu
P5297 bacillus su
P16954 synechococc
P1489 dictycylomu
P2131 bacillus su
P16954 synechococc
P1489 dictycylomu
P16954 synechococc
P1489 dictycylomu
P16954 synechococc
P1489 dictycylomu
P16954 synechococc
P1489 dictycylomu
P16954 synechococc
P1489 bacillus su
P29094 bacillus su
P195094 bacillus su
P195094 thermoanaer
P25057 saccharomyc
Q45101 bacillus co
P16950 t amylopull Description TREZ_ARTSP
TREZ_BRENE
TREZ_MYCTU
GLGB_BACCT
GLGB_BACCT
BULA_THENA
ANY_2DICTH
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU
GLGB_STRAU ū DB Length Query Score Result No.

ID TREZ	THEZ_RHISP STANDARD; PRT; 596 AA.
	15-255; 16-OCT-2001 (Rel. 40, Created)
	(Rel. 40,
	Malto-oligosyltrehalose trehalohydrolase (EC 3.2.1.141) (MTHase) (4-
DE alpha	-alpha-D-g
	(Maicooligosyi trenaiose trenaionydroiase). TREZ.
	Rhizobium sp. (strain M-11).
	ria; Proteobacteria; alpha subdivision; Rhizobiaceae group;
OX NCBI	Knizobiaceae; Knizobium. NCBT TaxID=391:
	NCE FROM N.A.
	MEDLINE=96219094; PubMed=8829547;
KA Marut	Maruta K., Hattori K., Nakada T., Kubota M., Sugimoto T., Kurimoto M.; "Cloning and commonging of trobalose biosumthosis gones from Dhizohium
	ing sequencing of crematose prostuciests genes from mittodium:
Bios	Biosci. Biotechnol. Biochem. 60:717-720(1996).
-	->4)-D-glucosidic
	inkage in 4-alpha-D-{(1->4)-alpha-D-glucanosyl}(n) trehalose to
	ield trehalose and alpha-(1->4)-D-glucan.
<u> </u>	PATHWAI: Trenalose blosynthesis. Stmitabiny, priongs to bamily 13 of clycosyl hyddolases also
•	
	This SWISS-PROT entry is copyright. It is produced through a collaboration
	between the Swiss Institute of Bioinformatics and the EMBL outstation -
	pean Bioinformatics Institute. There are no restrictions on
CC use	by non-profit institutions as long as its content is in no way
-	Modified and this Statement is not femoved. Usage by and for commercial.
בַּ בַ	requires a ficense in email to license
; ;	
EM	ЕМВL; D78001; ВАА11187.1;
	InterPro; IPR000461; Alpha_amylase.
	e; Glycosidase.
SQ SEQUENCE	1TE 255 255 BY SIMILARITY. NCE 596 AA; 65262 MW; 73EA80AE0534DDCD CRC64;
Query Match	32.8%;
Best Loc Matches	Local Similarity 39.5%; Pred. No. 1e-60; nes 215; Conservative 74; Mismatches 195; Indels 60; Gaps 12;
Qy 13	VNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTY
L	
TP QT	GRKDIWAPEAGTVTLLAGGERYEMGRRPGNGPADEGWWTAADAPTGADVDYGYLLDGDEI 74
Qy 66	EIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQ 115
5 <i>L</i> . qa	: :

GLGB_HAEIN AMY_BACME GLGB_SYNP7

AMY3_DICTH O16G_BACCE

TREC_BACSU 016G_BACTR

AMY 1_DEBOC

AMYB_PAEPO NEPU_BACST YDD1_SCHPO 016G_BACSU

CDAS_THEET
AMY1_SACFI
016G_BACCO
APU_THETY

2

IPR004193; isoamylase_N.

à a ò В ò g ò g ŏ g ò g ð a δ g

```
DR
DR
DR
SQ
                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                          8
                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Db
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (see http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Σ.
                                       235
                                                                                                                                        188 DAAHAAGLGVIQDVVYNHLGPSGNYLPRYGPYLKHGEGNTWGDSVNLDGPGSDHVRQYIL 247
                                                                                                                                                                                 ENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGK-----FVIAESDLND 289
                                                                                                                                                                                                         427
                                                                                                                                                                                                                                                                                                                                                                                                                                      SPYIRLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEA 458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                487
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                533
                                                                                                                                                                                                                                                                      PKIV--KDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGK 347
                                                                                                                                                                                                                                                                                                                                                      348 YSRYRGRTHGAPV--GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       FLKSKLSWK-----IDEEVLDYYKQLINIRKRYNNCKRVKEVRREGNCITLIMEKIGIIA 513
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Malto-oligosyltrehalose trehalohydrolase (EC 3.2.1.141) (MTHase) (4-alpha-D-{(1->4)-alpha-D-glucano}trehalose trehalohydrolase)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Kurimoto
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Ç
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             MEDLINE-96195835; PubMed-8605217;
Maruta K., Hattori K., Nakada T., Kubota M., Sugimoto T., Kurimoto Cloning and sequencing of trehalose biosynthesis genes from Arthrobacter sp. 036.";
Biochim. Biophys. Acta 1289:10-13(1996).
-!- CATALYTIC ACTIVITY: Hydrolysis of alpha-(1->4)-D-glucosidic linkage in 4-alpha-D-((1->4)-alpha-D-9lucanosyl)n trehalose to yield trehalose and alpha-(1->4)-D-glucano.
-!- PATHMAX: Trehalose biosynthesis.
-!- PATHMAX: TELONOS TO FRAMILY 13 OF GLYCOSYL HYDROLASES, ALSO KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                              EGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLV
                                                                                               176 NEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFIL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Bacteria; Firmicutes; Actinobacteria; Actinobacteridae;
Actinomycetales; Micrococcineae; Micrococcaceae; Arthrobacter.
NCBI_TaxID=1667;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                40, Last sequence update)
40, Last annotation update)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        598 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     (Maltooligosyl trehalose trehalohydrolase).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 (Rel. 40, Created)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Arthrobacter sp. (strain Q36).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       EMBL; D63343; BAA09668.1; -.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     (Rel. 40,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  SECUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SFDD 517
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                534 EFDD 537
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 16-OCT-2001
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   16-OCT-2001
16-OCT-2001
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      TREZ_ARTSP
Q44316;
                                                                                                                                                                                                                                                                    290 1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               RESULT 2
TREZ_ARTSP
                                                                                                                                                                                 236
               116
                                                                                                                                                                                                                        248
                                                                                                                                                                                                                                                                                                                                                                                             368
                                                                                                                                                                                                                                                                                                                                                                                                                                      406
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             428
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         514
```

InterPro; IPR000461; Alpha_amylase.

```
10;
                                                                                                                                                                                                                                                                                                              EKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGI 183
                                                                                                                                                                                                                                                                                                                                                                                                        GKLDYLAGLGVDFIELLPVNAFNGTHNWGYDGVQWFAVHEAYGGPEAYQRFVDAAHAAGL 197
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PDPASRYQPLGVHDKSQLI-RTDYQILD---LGKVKIEDLIIYELHVGTFSQEGNFKGVI 123
                                                                                                                                                                           Gaps
                                                                                                                                                                                                                                                   19 YDVWAPNAESVTLLAGGERYAMQRRAETGPEDAGWWTAAGAPTDGNVDYGYLLDGDETPL 78
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    16-OCT-2001 (Rel. 40, Created)
16-OCT-2001 (Rel. 40, Last sequence update)
16-OCT-2001 (Rel. 40, Last annotation update)
Malto-oligosyltrehalose trehalohydrolase (EC 3.2.1.141) (MTHase) (4-
alpha-D-[(1->4)-alpha-D-glucano]trehalose trehalohydrolase)
(Maltooligosyl trehalose trehalohydrolase).
                                                                                                                                                                                                             FKLWAPYVNSVKLKLSKKLIPMEK -----NDEGFFEVEIDDIEENLTYSYIIE-DKREI 67
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         t
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Yamamoto T., Maruta K., Watanabe H., Yamashita H., Kubota M., Fukuda S., Kurimoto M.; Fukuda S., Kurimoto M.; Trehalose producing operon treYZ from Arthrobacter ramosus S34."; Submitted (APR-2001) to the EMBL/GenBank/DDBJ databases.
-:- CATALYTIC ACTIVITY: Hydrolysis of alpha-(1->4)-D-glucosidic linkage in 4-alpha-D-{(1->4)-alpha-D-glucanosyl}(n) trehalose t
                                                                                                                                                                                                                                                                                                                                                                                                                                              AVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    244 TFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFV-----IAESDLNDPKIV--KD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              DCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   HGRPINFSAVHPAALVVCSQNHDQIGNRATGDRLSQTLPYGSLALAAVLTLTGPFTPMLL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             HGAPV - - GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         MGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEAFLKSKLSW
                                                                                                                                                                           34;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Arthrobacter ramosus.
Bacteria; Firmicutes; Actinobacteria; Actinobacteridae;
Actinomycetales; Micrococcineae; Micrococcaceae; Arthrobacter
                                                                                                                                     Length 598;
                                                                                                                                                                           Indels
                                                                       8B5C610AD3766947 CRC64;
                                                                                                                                                                         Mismatches 186;
                                                                                                                                   Score 959; DB 1;
Pred. No. 5.1e-60;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  575 AA.
                                                         SIMILARITY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    PRT;
                                                                                                                                                                       81;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 467 KIDEE-----VLDYYKOLINIRK 484
Pfam; PF00128; alpha-amylase; 1
Pfam; PF02922; isoamylase_N; 1.
                                                                           65831 MW;
                                                                                                                                   32.5%;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | :|: |:|:498 AEAAEGDHARLLELYRSLTALRR
                                                                                                                                                                         Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    STANDARD;
                                     Hydrolase; Glycosidase.
ACT_SITE 267 267
                                                                         598 AA;
                                                                                                                                                     Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       [1]
SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    NCBI_TaxID=1672;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           STRAIN-S34;
                                                                                                                                                                           202;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    TREZ_ARTRM
                                                       ACT_SITE
SEQUENCE
                                                                                                                                     Match
                                                                                                                                     Query Matcl
Best Local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        O9AJN6;
                                                                                                                                                                           Matches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                TREZ_ARTRM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      962
                                                                                                                                                                                                                                                                                         89
                                                                                                                                                                                                                                                                                                                                                                  124
                                                                                                                                                                                                                                                                                                                                                                                                        138
                                                                                                                                                                                                                                                                                                                                                                                                                                              184
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   378
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       414
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             356
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          TREZ
```

m

```
Brevibacterium helvolum
                                                                                                                                                                                                                                                                                                                                                                                          ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         7.1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               357
 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Db
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       염
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Dp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     염
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ö
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         염
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ð
                                                           This SWISS-PROT entry is copyright. It is produced through a collaboration between 'the Swiss Institute of Bioinformatics and the EMBL outstation the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                   10;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              172 VDACHARGLAVVQDVVYNHLGPSGNHLPDFGPYLGSGAANTWGDALNLDGPLSDEVRRYI 231
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    LENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIA----EKAHQLGK--FVIAESDLN 288
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  DPKIVKDDC--GYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDG 346
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    347 KYSRYRGRTHGAPVG-DLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYIL 405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEA 458
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               GPFTPMLFMGEEWGARTPWQFFTSHPEPELGEATARGRIAEFARMGWDPAVVPDPQDPAT 471
                                                                                                                                                                                                                                                                                                                                                                              ----KIEDLIIYELHVGTFS 114
                                                                                                                                                                                                                                                                                                                                                                                                      65 RSLRQPRGVH-------ELGREFDPARYAWGDDGWRGRDLTGAVIYELHVGTFT 111
                                                                                                                                                                                                                                                                                                                                                                                                                                QEGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKL 174
                                                                                                                                                                                                                                                                                                                                                                                                                                                       112 PEGTLDSAIRRLDHLVRLGVDAVELLPVNAFNGTHGWGYDGVLWYAVHEPYGGPEAYORF 171
                                                                                                                                                                                                                                                                                                   Gaps
                                                                                                                                                                                                                                                                                                                          15 FKLWAPYVNSVKLKL.--SKKLIPMEKNDEGFFEVE--IDDIEENLTYSYIIEDKREIPDP 70
                                                                                                                                                                                                                                                                                                                                                     64
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              16-OCT-2001 (Rel. 40, Created)
16-OCT-2001 (Rel. 40, Last sequence update)
16-OCT-2001 (Rel. 40, Last annotation update)
Malto-oligosyltrehalose trehalohydrolase (EC 3.2.1.141) (MTHase) (4-
alpha-D-[(1->4)-alpha-D-glucano|trehalose trehalohydrolase)
(Maltooligosyl trehalose trehalohydrolase).
             Trehalose biosynthesis.
Y: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO
                                                                                                                                                                                                                                                                                                                                          VNEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFI
                                                                                                                                                                                                                                                                        31.7%; Score 936; DB 1; Length 575; 38.7%; Pred. No. 2e-58;
                                                                                                                                                                                                                                                                                                  Indels
                                                                                                                                                                                                                     BY SIMILARITY.
; 284A3F20207E228B CRC64;
                                                                                                                                                                                                                                                                                                  82; Mismatches 177;
 trehalose and alpha-(1->4)-D-glucan
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         589 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              459 FLKSKLSWKIDEE-----VLDYYKQLINIRK 484
                                    KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                            71 ASRYQPLGVHDKSQLIRTDYQILDLGKV----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              EMBL; AB045141; BAB40766.1; -.
InterPro; IPR000461; Alpha_amylase.
Pfam; PF00128; alpha-amylase; 1.
Hydrolase; Glycosidase.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         PRT;
                                                                                                                                                                                                                                 63079 MW;
                                                                                                                                                                                                                                                                                                  Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         STANDARD;
                                                                                                                                                                                                                     250 250
575 AA; 630
                                                                                                                                                                                                                                                                                    Similarity
                                                                                                                                                                                                                                                                                    Best Local Simi
Matches 198;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            16-OCT-2001
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         TREZ_BREHE
                                                                                                                                                                                                                     ACT_SITE
SEOUENCE
                                                                                                                                                                                                                                                                          Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 052520;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          TREZ_BREHE
                                                                                                                                                                                                                                                                                                                                                                                                                                115
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    235
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               292
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       289
SE DE DATE
                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
```

```
entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@lsb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation-the Buropean Bioinformatics Institute. There are no restrictions on its use by non-profit institutions and a its content is in no way modified and this statement is not removed. Usage by and for commercial
                                                                                                                                                                                                               proteins for
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     310 NGYGLAGOWSDDFHTAVHVSVSGETTGYYSDFESLAVLAKVLKNGFLHDGSYSSFRGRHH 369
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     69 DPASRYQPLGVHDKSQLIR-TDYQILD---LGKVKIEDLIIYELHVGTFSQEGNFKGVIE 124
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          297 CGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTH 356
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     414
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             467
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              125 KLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIA 184
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         185 VILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKT 244
                                                                                                                                                                                                                                                                                                                                          to
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        15 FKLWAPYVNSVKLKLSKKLIPMEKND----EGFFEVEIDDIEENLTYSYIIE-DKREIP 68
                         Actinomycetales; Micrococcineae; Brevibacteriaceae; Brevibacterium.
NCBL_TaxID=1704;
                                                                                                                                                                                                                                      trehalose production in Brevibacterium helvolum.";
Submitted (DEC-1997) to the EMBL/GenBank/DDBJ databases.
-!- CATALYTIC ACTIVITY: Hydrolysis of alpha-(1->4)-D-glucosidic
linkage in 4-alpha-D-[(1->4)-alpha-D-glucanosyl](n) trehalose
yield trehalose and alpha-(1->4)-D-glucan.
-!- PATHWAY: Trehalose biosynthesis.
-!- SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             11 FDVWAPDVSSVVLVADGRQYPMQKKETAPGSEGWWTASDAPPNGDVDYGYLLDGNTTPVP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 245 FKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQ-----LGKFVIAESDLNDPKIV--KDD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                GEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQM-----IDPQSEEAFLKSKLSWK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     GAPVGD - - LPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             33;
                                                                                                                                                                           Kwon T., Kim C.H., Choi Y.D.;
"Maltooligosyl trehalose synthase/trehalohydrolase encode
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Length
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Indels
Bacteria; Firmicutes; Actinobacteria; Actinobacteridae;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           C282314B6E9BA029 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         30.1%; Score 890.5; DB 1;
39.1%; Pred. No. 3.2e-55;
iive 76; Mismatches 198;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             EMBL, AF039919; AAB95369.1; -.
InterPro: IPR000461; Alpha_amylase.
Pfam: PF00128; alpha-amylase; 1.
Hydrolase; Glycosidase.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        -----IDEEVLDYYKQLINIRKRY 486
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     490 EASTGDHARLLELYKSLTALRREH 513
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           BY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     64217 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Query Match
Best Local Similarity 39.19
Matches 197; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     589 AA;
```

10;

4

```
This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation - the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@lsb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Fleischmann R.D., Alland D., Eisen J.A., Carpenter L., White O., Peterson J., DeBoy R., Dodson R., Gwinn M.L., Haft D., Hickey E., Kolonay J.F., Nelson W.C., Umayam L.A., Ermolaeva M.D., Salzberg S.L., Delcher A., Utterback T., Weidman J., Khouri H., Gill J., Mikula A.,
                                                                                                                                                                                                                                                                                                                                                 STRAIN-H37RV;

MEDLINE-98295987; Pubmed-9634230;

MEDLINE-98295987; Pubmed-9634230;

MEDLINE-98295987; Pubmed-9634230;

MEDLINE-98295987; Pubmed-9634230;

A Cole S.T., Brosch R., Parkhill J., Garnier T., Churcher C., Harris D., Gordon S.V., Eiglmeier K., Easham D., Brown D., Chllingworth T., Connor R., Davies R., Devlin K., Feltwell T., Gentles S., Hamlin N., Holroyd S., Horisby T., Jagels K., Krogh A., McLean J., Woule S., Murphy L., Oliver S., Osborne J., Quall M.A., Rajandream M.A., Rogers J., Arutter S., Seeger K., Skelton S., Squares S., Squares R., Sulsron J.E., Taylor K., Whitehead S., Barrell B.G.;

T "Deciphering the biology of Mycobacterium tuberculosis from the complete genome sequence.";

In Nature 393:537-544(1998).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                 s:
                                                                                                                                                                                                                                                                                                                                                                                                     ö
                                                                                                                                                3.2.1.141) (MTHase) (4-
                                                                                                                                                                                                                                                  Bacteria; Firmicutes; Actinobacteria; Actinobacteridae;
Actinomycetales; Corynebacterineae; Mycobacteriaceae; Mycobacterium.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 "Whole genome comparison of Mycobacterium tuberculosis clinical and
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                laboratory strains.;
Submitted (APR-2001) to the EMBL/GenBank/DDBJ databases.
--- CATALYTIC ACTIVITY: Hydrolysis of alpha-(1-74)-D-glucosidic
linkage in 4-alpha-0-!(1-74)-alpha-D-glucanosyl)(n) trehalose
yield trehalose and alpha-(1-74)-D-glucan.
--- PATHWAR: Trehalose biosynthesis.
--- STMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO
KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                               01-0CT-1996 (Rel. 34, Last sequence update)
16-0CT-2001 (Rel. 40, Last annotation update)
Malto-oligosyltrehalose trehalohydrolase (EC 3.2.1.141) (MT)
Malto-oligosyl trehalose trehalohydrolase)
(Maltooligosyl trehalose trehalohydrolase)
TREZ OR RV1562C OR MT1613 OR MTCY48.03.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                // SIMILARITY.
506190468F44B862 CRC64;
                                             AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
Pfam; PF000128; alpha-amylase; 1.
Pfam; PF02922; isoamylase_N; 1.
Hydrolase; Glycosidase; Complete proteome.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            AE007027; AAK45880.1; ALT_INIT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ΒX
                                                                               (Rel. 34, Created)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 64076 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        EMBL; Z74020; CAA98329.1; -.
                                                                                                                                                                                                                                   Mycobacterium tuberculosis.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        STRAIN=CDC 1551 / Oshkosh;
                                           STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Tuberculist; Rv1562c; -.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 580 AA;
                                                                                                                                                                                                                                                                                                                                    SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                             NCBI_TaxID=1773;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               FIGR; MT1613;
                                    TREZ_MYCTU
Q10769;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Bishai W.;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ACT_SITE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SEQUENCE
                 FREZ_MYCTU
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              EMBL;
RESULT
```

Score 866.5; DB 1; Length 580; Pred. No. 1.5e-53;

29.38;

Query Match Best Local Similarity

```
This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation-the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions along as its content is in no way modified and this statement is not removed. Usage by and for commercial
 11;
                                                                                                                               63 ROPDGVHARSORWEPPGOFGAARTD---TGWPGRSVEGAVIYELHIGTFTTAGTFDAAIE 119
                                                                                                                                                                                414
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              185 VILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKT 244
                                                                                                                                                                                                                                                                                                                                                         297 CGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTH 356
                                                                                              YQPLGVHDKSQ------LIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFKGVIE 124
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          415 GEEYYETNPFFFFSDFSDPVLIKGVREGRLKE-----NNQMIDPQSEEAFLKSKLSWK 467
 37; Gaps
                                FKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYIIEDKREI-PDPASR 73
                                                              4 FRVWAPKPALVRLDVNGAVHAMTRSADGWWHTTV-AAPADARYGYLLDDDPTVLPDPRSA 62
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    01-APR-1993 (Rel. 25, Created)
01-APR-1993 (Rel. 25, Last sequence update)
01-OCT-1996 (Rel. 34, Last annotation update)
1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Kiel J.A.K.W., Boels J.M., Beldman G., Venema G.;
"The gigB gene from the thermophile Bacillus caldolyticus encodes a
thermolabile branching enzyme.";
                                                                                                                                                             KLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIA
                                                                                                                                                                                                                                                                                                               GAPV -- GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFM
                                                                                                                                                                                                                                                                                                                                                                                                                                           245 FKIDGLRLDAVHAIFDNSPKHILQEIAEKAH----QLGK--FVIAESDLNDPKIV--KDD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               -!- SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                DNA Seq. 3:221-232(1992).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 -!- MISCELLANEOUS: OPTIMAL ACTIVITY AT APPROXIMATELY 39 DEGREES
Mismatches 194; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Bacteria; Firmicutes; Bacillus/Clostridium group; Bacillus/Staphylococcus group; Bacillus.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  glycogen.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SEQUENCE FROM N.A. MEDLINE=93208370; Pubmed=1296817;
83;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    enzyme.";
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             : :|: || :|
479 EAGSGEHARLHRFYRDLIALR 499
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ----IDEEVLDYYKQLINIR 483
 Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Bacillus caldolyticus.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    NCBI_TaxID=1394;
Matches 187;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   CELSIUS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       GLGB_BACCL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    enzyme).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        P30537
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        GLGB_BACCL
                                13
                                                                                                                                                             125
                                                                                                                                                                                                                                                                                                                           239
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         468
                                                             Q
                                                                                                                             qq
                                                                                              δy
                                                                                                                                                             Qγ
                                                                                                                                                                                            qq
                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                        염
                                                                                                                                                                                                                            δ
                                                                                                                                                                                                                                                                                           οž
                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                         δy
                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         δ
```

S

```
NCBI_TaxID=1422;
                                                                                                                        glycogen.
                                                                                                                                                                                                                                                                                                                                                                                                                                  Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                               Best Local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    101
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          209
 a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                      29;
entities requires a license agreement (See http://www.isb-sib.ch/announce/
                                                                                                                                                                                                                                                                                                             GHLYKYEIITPDGRVLLKADPYAFYSELRPHTASIVYDLKGYEWNDSPWQRKKRRKRIYD 145
                                                                                                                                                                                                                                                                                                 LGKVKIEDLIIYELHVGTFSQ--EGNFKGVIEKLD----YLKDLGITGIELMPVAQFPGN 148
                                                                                                                                                                                                                                                                                                                                                                                      207 YF----SDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKTFKIDGLRLDAV----- 255
                                                                                                                                                                                                                                                                                                                                                                                                     ---HAIFDNS-PKHILQEIAEK--AHQLGKFVIAESDLNDPKIVKD--DCG----YKIDA 303
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   MGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVL 473
                                                                                                                                                                                                                                                                                                                                                                                                                                                       PNNDRLYENPYAVEFLRQLNEAVFAYDPNVWMIAEDSTDWPRVTAPTYDGGLGFNYKWNM 377
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             QWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPVGDL 363
                                                                                                                                                                                                           FGGNIEKNKGI----FKLWAPYVNSVKL----KLSKKLIPMEK-NDEGFFEVEIDDIEE 53
                                                                                                                                                                                                                        NLTYSY--IIEDKREI--PDPASRYQPLGVHDKS------QLIRTDYQILD 94
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             01-APR-1993 (Rel. 25, Created)
01-APR-1993 (Rel. 25, Last sequence update)
01-FEB-1995 (Rel. 31, Last annotation update)
1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     RDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIAVILDVVYNHI--GPEGNYLLGLGP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           364 PPRKFVVFIQNHDQVG-----NRGNG---ERLSILTDKTTYLMAATLYILSPYIPLIF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               DYYKQLINIRKRY------NKEVREGNCITLI 505
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   -YVKQLIACYKRYKPFYELDHDPRGFEWIDVHNAEQSIFSFIRRGKKEGDVLVIV 547
                                                                                                                                                               11.9%; Score 353; DB 1; Length 666; 23.9%; Pred. No. 2.2e-17; tive 95; Mismatches 192; Indels 1
                                                                                      Glycosyltransferase
                                                                                                                                1F64C31495BB1B6E CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Bacillus stearothermophilus.
Bacteria; Firmicutes; Bacillus/Clostridium group;
Bacillus/Staphylococcus group; Geobacillus.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           639 AA.
                                                                                                BY SIMILARITY
BY SIMILARITY
                                                                                                                      SIMILARITY
           or send an email to license@isb-sib.ch)
                                                                                  Glycogen biosynthesis, Transferase, ACT SITE 309 309 BY SIMI ACT_SITE 352 352 BY SIMI ACT_SITE 420 420 BY SIMI SEQUENCE 666 AA; 78096 WW; 1F64C
                            EMBL; 214057; CAA78440.1; -. InterPro; IPR00461; Alpha_amylase. InterPro; IPR004193; isoamylase_N. Pfam; PF00128; alpha-amylase; 1. Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                      Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           STANDARD;
                                                                                                                                                                          Best Local Similarity
Matches 142; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        GLGB_BACST
P30538;
                                                                                                                                                                  Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            enzyme)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               GLGB_BACST
                                                                                                                                                                                                                                                                                                                                                                                                                                                                            304
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   494
                                                                                                                                                                                                                                                                                                                      146
                                                                                                                                                                                                                                                                                                                                           149
                                                                                                                                                                                                                                                                                                                                                                                                                                  256
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   414
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         462
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             414
q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                           à
                                                                                                                                                                                                                                                    ŏ
                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                     ά
                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ö
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              á
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                q
```

```
This SWISS-PROT entry is copyright. It is produced through a collaboration between the SWISS Institute of Bioinformatics and the EMBL outstation-the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        26;
                                                                           Kiel J.A.K.W., Boels J.M., Beldman G., Venema G.;
"Molecular cloning and nucleotide sequence of the glycogen branching
enzyme gene (glgB) from Bacillus stearothermophilus and expression in
Escherichia coli and Bacillus subtilis.";
Mol. Gen. Genet. 230:136-144(1991).
-i- CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages of
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        54 NLTYSYII--EDKREI--PDPASRYQPLGVHDKSQLIR-TDYQILD------LGKVKI 100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                EDLIIYELHVGTF -- SQEGNF -- - - KGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYD 154
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    266 MQDRENYVWG-TANF-DLGKPEVRSFLISNALFWMEYFHVDGFRVDAVANMLYWPNSDVL 323
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  324 YKNTYAVEFLQKLNETVFAYDPNILMIAEDSTDWPRVTAPTYDGGLGFNYKWNMGWMNDI 383
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                424
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          146 OPLEIYELHFGSWKKKEDGSFYTYOEMARELIPYVLEHGFTHIELLPLVEHPFDRSWGYO
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     26 FGAHVIKKNGMVGTRFCVWAPHAREVRLVGSFNEWNGTNFNLMKVSNQGVWMIFIPENLE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            VFIQNHDQVGNRGNGERLSIL----TDKTTYLMAATLXILS-PYIPLIFMGEEYYETNPF : :||:| | :|| | ::
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       4 FGGNIEKNKGI----FKLWAPYVNSVKLKLS-----KKLIPMEKNDEGFFEVEIDDIEE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    86 GHLYKYEITTNDGNVLLKSDPYAFYSELRPHTASIVYNIKGYQWNDQTWRRKKQRKRIYD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          155 GVFLYAVQNTYGGPWELAKLVNEAHKRGIAVILDVVYNHI--GPEGNYLLGLGPYF---
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   FDNS-PKHILQEIAEK--AHQLGKFVIAESDLNDPKIVKD--DCG----YKIDAQWVDDF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     HHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPVGDLPPRKFV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            --LTYMETPPEHRKYVHN-----KVTFSLLYAYSENF------
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ALSO
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    121;
                                                                                                                                                                                                                                                                                                                                                                                               -i- MISCELLANEOUS: THE TEMPERATURE FOR OPTIMAL ACTIVITY IS APPROXIMATELY 55 DEGREES CELSIUS.
-i- SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DB 1; Length 639;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         -SDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKTFKIDGLRLDAV----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        89; Mismatches 197; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Glycogen biosynthesis; Transferase, Glycosyltransferase.
ACT_SITE 309 309 BY SIMILARITY.
ACT_SITE 352 352 BY SIMILARITY.
ACT_SITE 420 BY SIMILARITY.
SEQUENCE 639 AA, 74795 MW, F5BD4446B371E03A CRC64:
                                                                                                                                                                                                                                                                                                                                                                  PATHWAY: THIRD STEP IN GLYCOGEN BIOSYNTHESIS.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Pred. No. 1.1e-16;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         11.6%; Score 342.5; 24.9%; Pred. No. 1.16
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 PIR; S18599; S18599.
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
STRAIN=1503-4R;
MEDLINE=92079888; PubMed=1745226;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Pfam; PF00128; alpha-amylase; 1. Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            EMBL; M35089; AAA22482.1; -.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Matches 135; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Similarity
```

Mon Jul

```
the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      This SWISS-PROT entry is copyright. It is produced through a collaboration
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               STRAIN-MSBB / DSM 3109;

X MEDLINE-9287316; PubMed=10360571;
A MEDLINE-9287316; PubMed=10360571;
A MEDLINE-9287316; PubMed=10360571;
A Haft D.H., Hickey E.K., Peterson J.D., Nelson W.C., Ketchum K.A., McDonald L., Utterback T.R., Malek J.A., Linher K.D., Garrett M.M., Astewart A.M., Cotton M.D., Pratt M.S., Phillips C.A., Richardson D., Heidelberg J., Sutton G.G., Fleischmann R.D., Eisen J.A., Mhite O., Salzberg S.L., Smith H.O., Venter J.C., Fraser C.M.;
A Salzberg S.L., Smith H.O., Venter J.C., Fraser C.M.;
T. "Evidence for lateral gene transfer between Archaea and Bacteria from genome sequence of Thermotoga maritima.";
C.:-CATALYTIC ACTIVITY: Hydrolysis of (1->6)-alpha-D-glucosidic linkages in pullulan and in amylopectin and glycogen.
C.:-SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        the Swiss Institute of Bioinformatics and the EMBL outstation
414 ILPFSHDEVVH-GKKSLLSKMPGTYEEKFAQLRLLYGYLLTHPGKKLLFMGGEFGQ---- 468
                                  484
                                                        30-MAY-2000 (Rel. 39, Created)
30-MAY-2000 (Rel. 39, Last sequence update)
01-MAR-2002 (Rel. 41, Last annotation update)
Pullulanase precursor (EC 3.2.1.41) (Alpha-dextrin endo-1,6-alpha-
glucosidase) (Pullulan 6-glucanohydrolase).
                                425 FFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYKQLINIRK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Bibel M., Brettl C., Gosslar U., Kriegshaeuser G., Liebl W.; "Isolation and analysis of genes for amylolytic enzymes of the hyperthermophilic bacterium Thermotoga maritima."; FEMS Microbiol. Lett. 158:9-15(1998).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            C42DDE233D54FE77 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Hydrolase, Glycosidase, Signal, Complete proteome.
SIGNAL
                                                                                                                                                                                                                               843 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          BY SIMILARITY.
BY SIMILARITY.
BY SIMILARITY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         POTENTIAL.
PULLULANASE.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                         Thermotogales; Thermotoga.
                                                                                                                                                                                                                             PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; Isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                                                                         SEQUENCE FROM N.A.
STRAIN-MSB8 / DSM 3109;
MEDLINE-98115241; PubMed-9453151;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Pfam; PF00128; alpha-amylase; 1. Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               EMBL; AJ001087; CAA04522.1; -. EMBL; AE001821; AAD36907.1; -.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               96261 MW;
                                                                                                                                                                                                                               STANDARD;
                                                                                                                                                                                                                                                                                                                                                                        Thermotoga maritima
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           843 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                        NCBI_TaxID=2336;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          535
564
652
                                                                                                                                                                                                                                                                                                                                      glucosidase) (F
PULA OR TM1845
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  EMBL; AE00182
TIGR; TM1845;
                                                                                                        RY 486
                                                                                                                                         RY 505
                                                                                                                                                                                                                               PULA_THEMA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ACT_SITE
ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                           Bacteria:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ACT_SITE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          between
                                                                                                      485 1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           CHAIN
                                                                                                                                                                                                           PULA_THEMA
                                                                     469
                                                                                                                                         504
                                                                                                                                                                                                                                              ð
                                                                   g
                                                                                                    ò
                                                                                                                                       g
```

```
31;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Horinouchi S., Pukusumi S., Ohshima T., Beppu T.;
"Cloning and expression in Escherichia coli of two additional amylase genes of a strictly anaerobic thermophile, Dictyoglomus thermophilum, and their nucleotide sequences with extremely low quanine-plus-cytosine contents.";
Eur. J. Biochem. 176:243-253(1988).
                                                                                                                                                                                                                                                                                                LWDK-NYLAAKADKKKEWTEEELKNAQKLAGAILLTSQGVPFLHGGQDFCRTKN-FNDNS 713
                                                                                                                                                                                                                                                          YSYIIEDK---REIPDPASRYQPLGVHDKSQ-----LIRTDYQ--ILDLG-KVK-IEDL 103
                                                                                                                                                                                                                                                                                                                                                                                           -----QEGNFK----GVIEKLDYLKDLGITGIELMPVAQ 144
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            F-PGNR-----DWGYDGVFLYAV-----QNTYGGPWELAKLVNEAHKRGIAV 185
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         FYTGDELDKDFEKYYNWGYD-PYLFMVPEGRYSTDPKNPHTRIREVKEMVKALHKHGIGV 460
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     RIEDIEKTFKDVFVYDGKYSRYRGRTHGAPVGDLPPRKFVVFIQNHDQVGNRGNGERLSI 389
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          -----FDYERKLQFI------DVFNYHKGLIKLRKEHPAF 751
                                                                   Gaps
                                                                                                                             GGNIEKNKGIFKLWAPYVNSVKLKLSK-----KLIPMEKNDEGFFEVEIDDIEENLT 56
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       01-APR-1990 (Rel. 14, Created)
01-APR-1990 (Rel. 14, Last sequence update)
01-DEC-1992 (Rel. 24, Last annotation update)
Alpha-amylase 2 (EC 3.2.1.1) (1,4-alpha-D-glucan glucanohydrolase).
                                                                                                                                                                                                                                                                                                                                                                                                                                    GAVYSPEKTIFRVWSPVSKWVKVLLFKNGEDTEPYQVVNMEYKGNGVWEAVVEGDLDGVF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   461 IMDMVFPH-----TYGIGELSAFDQTVPYYFYRIDKT--GAYLN--ESGCGNVIASER
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          --- RKFILENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                NDPKIV-------KDDCGYKIDAQWVDDFHHAVH--AFITKEKDYYYQDFG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      -----MAATLYILSPYIPLIFMGEEYYETNPFFFFSD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                FSDPVLIKGVREGRLKENNOMIDPQSEEAFLKSKLSWKIDEEVLDYYKQLINIRK----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ILDVVYNHIGPEGNYLLGLG-----PYFSDRY-KTPWGLTFNFDDRGCDQV----
                                                             Indels 194;
Length 843;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      KETKIKRGVVGSINYDGKLIKSFA-----LDPEETINYAACHDN----
                                                                88; Mismatches 185;
                                 Pred. No. 6.3e-15;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             562 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Bacteria; Dictyoglomus group; Dictyoglomus NCBI_TaxID=14;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       SEQUENCE FROM N.A., AND SEQUENCE OF 1-8. STRAIN=H-6-12;
Score 320;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    MEDLINE=88329076; PubMed=2458257;
10.8%;
                                 23.4%;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Dictyoglomus thermophilum
                                                                   Conservative
                                                                                                                                                                                                                                                                                                                                                                                           104 IIYELHVGTFS------
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      LTDKTTYL-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | | : :|:
752 RLKNAEEIKK 761
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             RYNNCKRVKE 494
                                 Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             714 YNAPISING-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          AMY2_DICTH
P14898;
                                                                Matches 143;
Query Match
Best Local :
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        AMY2_DICTH
ID AMY2_D
A C 10.4 APR
DT 01.4 APR
DT 01.5 APR
DT 01.5 APR
DT 01.5 APR
DT 01.5 APR
DT 01.5 APR
C N CBLT
C N NCBLT
T
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCBLT
C N NCB
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             σ
                                                                                                                                                                                                                                                                                                                                                                                                                                                            342
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     330
                                                                                                                                വ
                                                                                                                                                                                             226
                                                                                                                                                                                                                                                          57
                                                                                                                                                                                                                                                                                                                           286
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            145
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         402
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         186
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           888
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        556
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      390
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                959
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                430
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             485
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             RESULT
                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                        Pp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     d
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             셤
                                                                                                                                                                                                                                                              δ
                                                                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
```

```
degradation.
                                                                                                                                                                                                                                                                                                                                               STRAIN=168;
                                            GLGB_BACSU
P39118;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ACT_SITE
ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Complete
                                                                                                                                                                          enzyme).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Matches
                                              This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation-the Buropean Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 24;
                                                                                  MISCELLANEOUS: WHEN COMPARED TO AMYA, AMYB PRODUCED LARGER AMOUNTS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          276 MPKINLKNK---EAIDYIINAAKYWIREFGISGYRMD--HATGPDINFWSIFYYNLKSEF 330
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  171
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        215
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             172 AKLVNEAHKRGIAVILDVVYNHIG------PEGNYLLGLGPYFSDRYKTPWGL-- 218
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        219 --TFNFDDRGCDQVRKFILENVEYWFKTFKIDGLRLDAVHA------IFDNSPK--- 264
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      318 TKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPVGDLPPRKFVVFIQNHDQ 377
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                378 VGNRGNGERLSILFDKTTYLMAATLYILSPYIPLIFMGEEYYETNPFFFFSDFSDPVLIK 437
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ----SNRFLWVAKDKKLLRLASIFQFSINAIPIIYNGQE-----MGCSQYRD--ILE 450
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       7 NIEKNKGIFKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYIIEDKRE 66
                                                                                                                                                                                                                                                                                                                                                                                                                        Interpro; IPR000461; Alpha_amylase.
Pfam; PF00128; alpha-amylase; 1.
Hydrolase; Glycosidase; Carbohydrate metabolism; Multigene family.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |:: | :| | :|| | :|| | :|| | | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| | :|| |
                                                                                                      OF REDUCING SUGAR,
SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO
KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ----GNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWEL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      -----HILQEIAEKAHQLGKFVIAESDLNDPKIVKDDCGYKIDAQWVDDFHHAVHAFI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Indels 178;
  CATALYTIC ACTIVITY: Endohydrolysis of 1,4-alpha-glucosidic
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             500 FSDMISFIKETQEESILVLINIEDKREIFNLNGTYRDLFSGNIYTNSLKLG 550
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 --NNCKRVKEVRREGNCITLIMEK----IGIIASFDDIVINSKITGNLLIG 531
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       DB 1; Length 562;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              GVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYKQLINIRKRY----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         67 IPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQE--
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             BY SIMILARITY.
BY SIMILARITY.
9583342CFB7A369F CRC64;
                   linkages in oligosaccharides and polysaccharides
PATHWAY: POLYSACCHARIDE DEGRADATION.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Mismatches 180;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     10.7%; Score 315; DB 1; 21.7%; Pred. No. 8.3e-15;
                                                                                                                                                                                                                                                                                                                      or send an email to license@isb-sib.ch).
                                                           SUBCELLULAR LOCATION: Cytoplasmic
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Conservative 105;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     66999 MW;
                                                                                                                                                                                                                                                                                                                                                              EMBL; X13199; CAA31586.1; -.
                                                                                                                                                                                                                                                                                                                                                                                    .2; S01312.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     562 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Best Local Similarity
Matches 128; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                      HSSP; Q08751; 1BVZ
                                                                                                                                                                                                                                                                                                                                                                                  S0131
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ACT_SITE
ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    265
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           117
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    405
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              438
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         451
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   487
q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Pp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           οχ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        õ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ŏ
```

```
This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL cutstation the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               30;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Lapidus A., Galleron N., Sorokin A., Ehrlich S.D.; "Sequencing and functional annotation of the Bacillus subtilis genes in the 200 kb rrnB-dnaB region.";
                                                   01-FEB-1995 (Rel. 31, Created)
01-FEB-1995 (Rel. 31, Last sequence update)
16-OCT-2001 (Rel. 40, Last annotation update)
1.4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Microbiology 143:3431-3441(1997).

-!- FUNCTION: CATALYSES THE FORMATION OF THE ALPHA-1,6-GLUCOSIDIC
LINKAGES IN GLYCOGEN BY SCISSION OF A 1,4-ALPHA-LINKED
OLIGOSACCHARIDE FROM GROWING ALPHA-1,4-GLUCAN CHAINS AND THE
SUBSEQUENT TRANSFER OF THE OLIGOSACCHARIDE TO OTHER PARTS OF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           INDUCTION: EXPRESSED EXCLUSIVELY ON MEDIA CONTAINING CARBON SOURCES THAT ALLOW EFFICIENT SPORULATION.
SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      an
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ALPHA-1,4-GLUCAN CHAINS.
CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages of
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Indels 163;
                                                                                                                                                                                                                                                                                                                                                                                                                                                               Kiel J.A.K.W., Boels J.M., Beldman G., Venema G., "Glycogen in Bacillus subtilis: molecular characterization of operon encoding enzymes involved in glycogen biosynthesis and
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Length 627;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Glycogen biosynthesis; Transferase; Glycosyltransferase;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                64B0A5553B6767BA CRC64;
                                                                                                                                                                                                                                                            Bacteria; Firmicutes; Bacillus/Clostridium group; Bacillus/Staphylococcus group; Bacillus.
NCBI_TaxID=1423;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Score 313.5; DB 1;
Pred. No. 1.2e-14;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               98; Mismatches 207;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       glycogen.
PATHWAY: THIRD STEP IN GLYCOGEN BIOSYNTHESIS.
627 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SIMILARITY.
SIMILARITY.
SIMILARITY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              PIR; S36624; S36624.
Subtliist; B610907; glgB.
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase.N.
   PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                    MEDLINE=94195107; PubMed=8145641;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           MEDLINE=98048467; PubMed=9387221;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Mol. Microbiol. 11:203-218(1994)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Pfam; PF00128; alpha-amylase; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           BY
BY
BY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               420 B
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                EMBL; 225795; CAA81040.1; -.
EMBL; AF008220; AAC00214.1; -.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Pfam; PF02922; isoamylase_N;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     10.6%;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 23.48;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               143; Conservative
   STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      352
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        309 3
352 3
420 4
627 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Similarity
                                                                                                                                                                                                                                 Bacillus subtilis.
                                                                                                                                                                                                                                                                                                                                                                                SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         proteome.
```

4 FGGNIEKNKG----IFKLWAPYVNSVKLK-----LSKKLIPMEKNDEGFFEVEIDDIEE 53

δλ

œ

```
258
                                                                                                                                                                                                                                                                                                                      : |::| :| 11 | 375 WINMGWMNDVLKYMET-PPEERRHCHQLISFSLLYAFSEHFVLPFSHDEVVYGKKSL---- 429
                                                              86 KERYKYEIVTNNGEIRLKADPYAIYSEVRPNTASLIYDLEGYSWQDQKWQKKQKAKTLYE 145
                                                                                         ILDLGKVKIEDLIIYELHVGTFSQEG-----NFKGVIEKL-DYLKDLGITGIELMPVAQF 145
                                                                                                          F---DNSPKH---ILQEIAEKAHQLGK-----FVIAESDLNDPKI--VKDDCG----YK 300
                                                                                                                                                                                                                                                                     LYWPNQDERHTNPYAVDFLKKLNQTMREAYPHVMMIAEDSTEWPQVTGAVEGGLGFHYK 374
                                                                                                                                             PGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIAVILDVVYNHI--GPEGNYLLG 203
                                                                                                                                                                                                                                                                                                                                                           355 THGAPVGDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFM 414
                                                                                                                                                                                                                                                                                                                                                                                     ----LNKMPGDYWQKFAQ------462
                                                                                                                                                                                                                                                                                                                                                                                                              GEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQMID--PQSEEA-----FLKS 462
                                                                                                                                                                                                                                                                                                                                                                                                                                                                 KLSWKIDE----EVLDYY--KQLINIRKRYNNCKRVKEVRREGNCITLIMEKIGIIASF 515
                                                                                                                                                                                                                                                                                                        301 IDAQWVDDFHHAVHAFITKEKDYYYQ--DFGRIEDIEKTFKDVFVYD----GKYSRYRGR 354
                                       91
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      01-OCT-1996 (Rel. 34, Created)
1-OCT-1996 (Rel. 34, Last sequence update)
01-OCT-1996 (Rel. 34, Last annotation update)
1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           from
NLTYSY-IIEDKREI---PDPASRYQPLGVH-------DKSQLIRTDYQ
                                                                                                                                                                                                LGPYFS-----DRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKTFKIDGLRLDAVHAI
                                                                                                                                                                                                                                                                                                                                                                                                                                Streptomyces aureofaciens.
auteria: Firmicutes; Actinobacteria; Actinobacteridae;
Actinomycetales; Streptomycineae; Streptomycetaceae; Streptomyces.
NCBI_TaxID=1894;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Homerova D., Kormanec J.; "Cloning enzyme gene, glgB,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          glycogen.
PATHWAY: THIRD STEP IN GLYCOGEN BIOSYNTHESIS.
SUBUNIT: MONOMER (BY SIMILARITY).
SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES,
KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Streptomyces aureofaciens.;
Biochim. Biophys. Acta 1200:334-336(1994).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             764 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SEQUENCE FROM N.A.
STRAIN-CCM 3239 / ATCC 10762;
MEDLINE-94347823; Pubmed-8068720;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DDIVINSKITG 526
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       : | : |:
551 TPVVYHQYDVG 561
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     01-0CT-1996 (
01-0CT-1996 (
01-0CT-1996 (
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            GLGB_STRAU
P52980;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            enzyme).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  463
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 STRAU
                                                                                        92
                                                                                                                                                                      197
            56
                                                                                                                   146
                                                                                                                                            146
                                                                                                                                                                                                                                                   259
                                                                                                                                                                                                                                                                              315
                                                                                                                                                                                                                                                                                                                                                                                                              115
                                                                                                                                                                                                204
                                                                                                                                                                                                                                                                                                                                                                                    430
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    516
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 GLGB_
            셤
                                                           g
                                                                                        ò
                                                                                                                 g
                                                                                                                                                              q
                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                           ò
                                                                                                                                                                                               ò
                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                  οy
                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                               à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Dp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  õ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
```

```
This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                              27;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   : | ::|: | :|| | :|: |: |: | ALGSQPMEHQGVAGTRFTVWAP--NALGVRVTGDFSYWDAVAYPWRSLGASGVWELFLPG 219
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 51 IEENLTYSYII----EDKREI-PDPASRYQPLGVHDKSQLIRTDYQILDL-----GKVKI 100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ED--LIIYELHVGTFSQEGNFKGVIEKLD-YLKDLGITGIELMPVAQFPGNRDWGYDGVF 157
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  --DNSPK------HILQEIAEKAHQL--GKFVIAESDLNDPKIVK--DDCGYKID 302
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     303 AQWVDDFHHAVHAFITKE---KDXYXQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAP 359
                                                                                                                                                                                                                                                                                                                                                                                                              Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                               3 SFGGNIEKNKGI----FKLWAPYVNSVKLKLSKKL-----IPMEK-NDEGFFEVEIDD 50
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      01-0CT-1996 (Rel. 34, Created)
01-0CT-1996 (Rel. 34, Last sequence update)
16-0CT-2001 (Rel. 40, Last annotation update)
1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    EGDWSPNAHGGREDLDAVALLQEMNATVYRRFPGVVTIAEESTAWDGVTRPTDSGGLGFG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           360 VGDLPPRKFVVFIQNHDQVGNRGNGERLSILT-----DKTTYLMAATLYILSPYIPL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             158 LYAVQNTYGGPWELAKLVNEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDR----YK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              214 TP-----WGLTFNFDDRGCDQVRKFILENVEYWFKTFKIDGLRLDAVHAIF-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             10.0%; Score 296.5; DB 1; Length 764; 24.6%; Pred. No. 2.5e-13; ive 88; Mismatches 177; Indels 119
                                                                                                                                                                                                                                                 Glycogen biosynthesis, Transferase, Glycosyltransferase.

ACT_SITE 440 440 BY SIMILARITY.
ACT_SITE 493 493 BY SIMILARITY.
ACT_SITE 551 561 BY SIMILARITY.
SEQUENCE 764 AA, 85325 WW, 6B45482E4A26BACF CRC64;
                                                                                                                                                                                                                                                                BY SIMILARITY.

BY SIMILARITY.

BY SIMILARITY.

6845482E4A268ACF CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     770 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                IFMGEEYYETN-----PFFFFSDFSDP 433
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   LFMGQEFAQGSEWSETYGPDWWVLDSSYP 629
                                                                                                                                         EMBL; L11647; AAA67437.1; -. InterPro; IPR000461; Alpha_amylase. InterPro; IPR001899; Gram_pos_anchor. InterPro; IPR00193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Synechocystis sp. (strain PCC 6803).
                                                                                                                                                                                                              Pfam; PF00128; alpha-amylase; 1.
Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                            Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            enzyme).
GLGB OR SLL0158.
                                                                                                                                                                                                                                                                                                                                                                                              Best Local Sim
Matches 125;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     GLGB_SYNY3
P52981;
                                                                                                                                                                                                                                                                                                                                                                             Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       GLGB_SYNY3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  454
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        101
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               396
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             552
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                412
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 601
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  260
 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Db
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                               ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Ω
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ογ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Op
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ΩŽ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Dp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
```

```
FIGR; HI1358;
                                                                                                                                                                                                                                                               Venter J.C.;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               114;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Matches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              197
  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ρp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                              This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation-the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       14;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   105 IYELHVG-----TFSQEG-----TFSQEG-136
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      137 IELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIAVILDVVYNHIGP 196
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      76; Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        140 KGVYFAVWAPNARNVSILGDFNNWDGRLHQMRKRNNMVWELFIPELGVGTSYKYEIKNWE 199
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ----EIPDPASRYQPLGVHDKSQLIRTD---YQILDLGKVKIEDLI------- 104
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          200 GHIYEKTDPYGFYQE--VRPKTASIVADLDGYQWHD-----EDWLEARRTSDPLSKPVS 251
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              252 VYELHLGSWLHTAYDEPVKTLHGEGVPVEVSEWNTGARFLTYYELVDKLIPYVKELGYTH 311
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          :|: | | | :|| :| | :|| :|| 372 DGHGLAFFDGTHLYEHGDPRKGEHK-EWGTLIFNY---GRNEVRNFLVANALEWFDKYHI 427
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                12 KGI-FKLWAPYVNSVKL-----KLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYIIEDKR 65
                                 MEDLINE=96127529; PubMed=8590279; Raneko T., Tanaka A., Sato S., Kotani H., Sazuka T., Miyajima N., Sugiura M., Tabata S.; Sequence analysis of the genome of the unicellular cyanobacterium Squence analysis of the genome of the unicellular cyanobacterium Synechocystis sp. strain PCC6803. I. Sequence features in the 1 Mb region from map positions 64% to 92% of the genome."; DNA Res. 2:153-166(1995).
                                                                                                                                                                                -:- SUBUNIT: MONOMER (BY SIMILARITY).
-:- SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          EGN-----YLLGLGPYFSDRYKTPWG-LTFNFDDRGCDQVRKFILENVEYWFKTFKI
                                                                                                                                          -1- CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages of
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            9.5%; Score 282; DB 1; Length 770; 28.9%; Pred. No. 2.6e-12; tive 46; Mismatches 97; Indels
                                                                                                                                                                                                                                                                                                                                                                                                        Glycogen biosynthesis; Transferase; Glycosyltransferase;
                                                                                                                                                                                                                                                                                                                                                                                                                                 Y SIMILARITY.
Y SIMILARITY.
Y SIMILARITY.
A435AFCA7703FA8A CRC64;
 Cyanobacteria; Chroococcales; Synechocystis.
                                                                                                                                                                   -! - PATHWAY: THIRD STEP IN GLYCOGEN BIOSYNTHESIS.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     659 AA.
                                                                                                                                                                                                                                                                                                               or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                   EMBL; D63999; BAA10073.1; -.
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
Pfam; PF00128; alpha-amylase; 1.
Pfam; PF02922; isoamylase.N; 2.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                  BY
BY
BY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               01-NOV-1995 (Rel. 32, Created)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      89527 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Query Match 9.5'
Best Local Similarity 28.9'
Matches 89; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                  433
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      770 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                      Complete proteome.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            248 DGLRLDAV 255
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    428 DGMRVDAV 435
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     GLGX_HAEIN
P45178;
                                                                                                                                                                                                                                                                                                                                                                                                                               ACT_SITE
ACT_SITE
ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           RESULT 13
GLGX_HAEIN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          197
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   99
g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DA P
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   οχ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 qq
```

```
This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation-the Buropean Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 143 AQFPGNRD-WGYDGVFLYAVQNTYGGP----WELAKLVNEAHKRGIAVILDVVYNHIG-P 196
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           268 EQTY----PIFSQRGIDDQTYYWRNDQGRYINW--TGCGNMLNLSSDVGRKWVVDCLRY 320
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              208 LOARGLONYWGYNPLAMFAVEPKYAATNNPLAEFKTMVKAFHKAGIEVILDVVFNHSAES 267
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             321 WVEQCHIDGFRFDLATVLGRDTPDF-----NSSAQLFTDIKNEPSLQNIKLIAEPWDIG 374
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   296 DCGYKID-----AQWVDDFHHAVHAF---ITKEKDYYYQDFGRIEDIEK------ 336
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Fleischmann R.D., Adams M.D., White O., Clayton R.A., Kirkness E.F., Kerlavage A.R., Bult C.J., Tomb J.-F., Dougherty B.A., Merrick J.M., McKenney K., Sutton G., Fitzhugh W., Fields C.A., Gocayne J.D., Scott J.D., Shirley R., Liu L.-I., Glodek A., Kelley J.M., Weldman J.F., Phillips C.A., Spriggs T., Hedblom E., Cotton M.D., Utterback Tr., Hanna M.C., Nguyen D.T., Sauddek D.M., Brandon R.C., Fine L.D., Fritchman J.L., Fuhrmann J.L., Geoghagen N.S.M., Gnehm C.L., McDonald L.A., Small K.V., Fraser C.M., Smith H.O.,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ILILEULAGE AND ... Science 269:496-512(1995).
-!- FUNCTION: THIS PROTEIN MAY BE PART OF A GLYCOGEN BIOSYNTHETIC/
CATABOLIC OPERON BUT IS NOT REQUIRED FOR GLYCOGEN SYNTHESIS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  : |:||||| |||'|
148 ETIVYELHVKGFSQLNEKIPAALRGTYTGLAHPVNLAYLKELGVTAVELLPVNFHINEPH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               102 DLIIYELHVGTFSQ------EGNFKGVIE--KLDYLKDLGITGIELMPV-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               EGNYLLGLGPYFSDR-----YKTPWGLTFNFDDRGC------DQVRKFILENVEY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            241 WFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIVKD----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Glycogen biosynthesis; Hydrolase; Glycosidase; Complete proteome. ACT_SITE 333 333 BY SIMILARITY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Indels 131;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             9.4%; Score 276.5; DB 1; Length 659; 24.2%; Pred. No. 5.2e-12; ative 70; Mismatches 157; Indels 131
                                                                                                                                                                                                    Bacteria; Proteobacteria; gamma subdivision; Pasteurellaceae;
Haemophilus.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   "Whole-genome random sequencing and assembly of Haemophilus influenzae \mathrm{Rd}.\,";
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          E2B71F610E8B1CAC CRC64;
01-NOV-1995 (Rel. 32, Last sequence update)
16-0CT-2001 (Rel. 40, Last annotation update)
Glycopen operon protein glgX (EC 3.2.1.-).
GLGX OR HI1358.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    BY SIMILARITY.

BY SIMILARITY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                         SEQUENCE FROM N.A.
STRAIN-RD / KW20 / ATCC 51907;
MEDLINE-95350630; PubMed-7542800;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Pfam; PF00128; alpha-amylase; 1. Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          75290 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     EMBL; U32815; AAC23005.1; -. HSSP; P10342; 1BF2.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Conservative
                                                                                                                                                                  Haemophilus influenzae
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          659 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    (BY SIMILARITY)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Similarity
                                                                                                                                                                                                                                                                                     NCBI_TaxID=727;
```

22;

Tuberculist; Rv1326c;

```
δλ
                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                         ŏ
                                                                                                                                                                                                                                                                                                                                                                                      q
                                                                                                                                                                                                                                                                                                                                                                                                                                                 Dp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Db
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ōλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            SEQUENCE FROM N.A.
STRAIR-CDC 1551 / Oshkosh;
STRAIR-CDC 1551 / Oshkosh;
Fleischmann R.D., Alland D., Eisen J.A., Carpenter L., White O.,
Peterson J., DeBoy R., Dodson R., Gwinn M.L., Haft D., Hickey E.,
Kolonay J.F., Nelson W.C., Umayam L.A., Ermolaeva M.D., Salzberg S.L.,
Delcher A., Utterback T., Weidman J., Khouri H., Gill J., Mikula A.,
Bishai W.;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Ω.
                                                                                           ----SILTDKTTYLMAATL--YILSPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVR 440
                                                   435 NFITAHDGFTLKDLVSYNOKHNETNGEENRDGRNE-----NYSYNH---GVEGSTESL 484
375 HYGYQVGNFPSYFAEWNDRFRDDLCRFWLWKSGEIGAFAERFAGSSDLFKKNDRLPHTTL 434
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            s:
                                                                                                                                                                                                                                                                                                                                                                                                    Bacteria; Firmicutes; Actinobacteria; Actinobacteridae; Actinomycetales; Corynebacterineae; Mycobacterium
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Whole genome comparison of Mycobacterium tuberculosis clinical and
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Cole S.T., Brosch R., Parkhill J., Garnier T., Churcher C., Harris Gordon S.V., Eiglmeder K., Gas S., Barry C.E. III, Tekaia F., Badcock K., Basham D., Brown D., Chillingworth T., Connor R., Davies R., Devlin K., Feltwell T., Gentles S., Hamlin N., Holroyd S., Osborne J., Quill M.A., Moles S., Hamlin N., Holroyd S., Osborne J., Quill M.A., Rajandream M.A., Rogers J., Rutter S., Seeger K., Skelton S., Squares S., Squares R., Sulston J.E., Taylor K., Whitehead S., Barrell B.G.; Deciphering the blology of Mycobacterium tuberculosis from the complete genome sequence.";
                                                                                                                                                                                                                                                                                           01-OCT-1996 (Rel. 34, Created)
1-OCT-1996 (Rel. 34, Last sequence update)
16-OCT-2001 (Rel. 40, Last amontation update)
Probable 1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen
                              -----TFKDVFVYDGKYSRYRGRTHGAPVGDLPPRKFVVFIQNHDQVGNRGNGERL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   91ycogen.
PATHRD STEP IN GLYCOGEN BIOSYNTHESIS.
SUBUNT: MONOMER (BY SIMILARITY).
SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ō
                                                                                                                                                                         laboratory strains.";
Submitted (APR-2001) to the EMBL/GenBank/DDBJ databases.
-1- CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages
                                                                                                                                                       EGRLKENNQMIDPQSEEAFLKSKLSW-KIDEEVLDYYKQLINIRKRYNNCKR
                                                                                                              | : : | : : | : | SEPQKSAVENNRTFAQSGLIMSLLLANGTPMLLAGDEFGNTQ-----
                                                                                                                                                                                                                                                               731 AA
                                                                                                                                                                                                                                                                                                                                                       branching enzyme).
GLGB OR RV1326C OR MT1368 OR MTCY130.11C.
                                                                                                                                                                                                                                                               PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              MEDLINE=98295987; PubMed=9634230;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               EMBL; 273902; CAA98090.1; -.
EMBL; AE007010; AAK45632.1; -.
TIGR; MT1368; -.
                                                                                                                                                                                                                                                                                                                                                                                       Mycobacterium tuberculosis.
                                                                                                                                                                                                                                                               STANDARD;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                 SEQUENCE FROM N.A. STRAIN=H37RV;
                                                                                                                                                                                                                                                                                                                                                                                                                                 NCBI_TaxID=1773;
                                                                                                                                                                                                                                                               GLGB_MYCTU
                                                                                                                                                                                                                                 RESULT 14
GLGB_MYCTU
                                                                                                                       485
                                                                                           388
                                                                                                                                                      441
d
                                                           g
                                                                                                                    g
                                                                                                                                                      ò
                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                   ò
                                                                                         ŏ
```

```
23;
                                                                                                                                                                                                                                                                                                                                                                                                                                                 62 EDKREIPDPASRYQPLGVHDKSQLIRTDYQILD-----LGKVKIEDLIIYELHVGTF 113
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     114 SQEGNFKGVIEKL-DYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELA 172
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             LTFNFDDRGCDQVRKFILENVEYWFKTFKIDGLRLDA--------VHAI 258
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                259 FDN-SPKHILQEIAEKAHQL--GKFVIAE----SDLNDPKIVKDDCGYKIDAQWVDDFH 310
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            RENLEAVQFLQEMNATAHKVAPGIVTIAEESTPWSGVTRPTNIG---GLGFSMKWNMGWM 492
                                                                                                                                                                                                                                                                                                                                                                         Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       311 HAVHAFITKE---KDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPVGDLPPRK 367
                                                                                                                                                                                                                                                                                                                                                                                                                  15 FKLWAPYVNSVKL-----KLSKKLIPME-KNDEGFFEVEIDDIEENLTYSY-----II 61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      01-JUN-1994 (Rel. 29, Created)
01-JUN-1994 (Rel. 29, Last sequence update)
16-OCT-2001 (Rel. 40, Last annotation update)
1,4-alpha-glucan branching enzyme (EC 2.4.1.18) (Glycogen branching
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     209 TDR---ADPFAFGTEVPPQTASRVTSSDYTWGDDDWMAGRALRNPVNEAMSTYEVHLGSW
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  368 FVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPY-----IPLIFMGEEY 418
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      HDTLDYVSRDPVYRSYHHH------EMTFSMLYAFSENY-----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Euteleostomi;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       TISSUE-Liver;
MEDLINE-93216700; PubMed-8463281;
Thon V.J., Khalil M., Cannon J.F.;
"Isolation of human glycogen branching enzyme cDNAs by screening
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             --VLPLSHDEVVH-GKGTLWGRMPG-NNHVKAAGLRSLLAYQWAHPGKQLLFMGQEF
                                                                                                                                                                                                                                                                                                                           Score 273; DB 1; Length 731;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Homo sapiens (Human).
Eukaryota; Metazoa; Chordata; Craniata; Vertebrata; Eutele
Mammalia; Eutheria; Primates; Catarrhini; Hominidae; Homo.
                                                                                   Glycogen biosynthesis; Transferase; Glycosyltransferase; Complete proteome.

ACT_SITE 411 411 BY SIMILARITY.
                                                                                                                                                      BY SIMILARITY.

BY SIMILARITY.

P -> A (IN REF. 2).

P -> Q (IN REF. 2).

W. EE2BFEF765352617 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                173 KLVNEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYK-TP----
                                                                                                                                                                                                                                                                                                           9.2%; Score ... 18-11, 24.7%; Pred. No. 18-11, ... 71; Mismatches 168; ... Try Mismatches 168; ... 71; Mismatches 168; ... 71; Mismatches 168; ...
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                702 AA
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                PRT;
                                             Pfam; PF00128; alpha-amylase; 1. Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                            223 F
81729 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  complementation in yeast.";
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    enzyme) (Brancher enzyme)
                                                                                                                                                                                                                                                                                                                                                                         Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                STANDARD;
                                                                                                                                          411
464
532
214
                                                                                                                                                           464
532
214
223
731 AA;
                                                                                                                                                                                                                                                                                                                                               Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    NCBI_TaxID=9606;
                                                                                                                                                                                                                                                                                                                                                                      Matches 118;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                GLGB_HUMAN
                                                                                                                                                           ACT_SITE
ACT_SITE
CONFLICT
                                                                                                                                                                                                                                                                                                                           Query Match
                                                                                                                                                                                                                                CONFLICT
                                                                                                                                                                                                                                                        SEQUENCE
                                                                                                                                                                                                                                                                                                                                                      Local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        GLGB_HUMAN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     493
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    378
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             526
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              GBE1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   RESULT
```

```
483
                                                                                                                                             420
                              Q
                                                      g
                                                                              δy
                                                                                                           g
                                                                                                                                            δ
                                                                                                                                                                    Q
                                                                                                                                                                                                 δy
                                                                                                                                                                                                                             qq
                                                                                                                                                                                                                                                             ŏ
                                                                                                                                                                                                                                                                                                    This SWISS-PROT entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation-the European Bioinformatics Institute. There are no restrictions on its use by non-profit institutions as long as its content is in no way modified and this statement is not removed. Usage by and for commercial entities requires a license agreement (See http://www.isb-sib.ch/announce/or send an email to license@isb-sib.ch).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           29;
                                                                                 135 TGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIAVILDVV---- 190
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  -----YNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKF 233
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  234 ILENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGK-FVIAESDLNDPKI 292
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 75 SFGVHRCADGGLYSKEWAPGAEGVFLTGDFNGWNPFSYPYKKLDYGKWELYIPPKQNKSV 134
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            135 LVPHGSKLKVVITSKSGEILYRISPWAKYVVREGDNVNYDWIHWD----PEHSYEFK--- 187
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       79 VHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFKG-...-VIEKLDYLKDLGI 134
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     293 SKNSADGLNMFDGTDSCYFHSGPRGTHDLWDSRLFA---YSSW-------EVLRF 337
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           293 VKDDCGYKIDAQWVDDFHHAVHAF----ITKEKD----------YYYQDFGRI 331
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 -----ENLTYSYIIEDKREIPDPASRYQPLG 78
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       SFGGNIEKNKGIF-KLWAPYVNSVKLK----LSKKLIPMEKNDEGFFEVEIDDIE---- 52
         FUNCTION: REQUIRED FOR SUFFICIENT GLYCOGEN ACCUMULATION. THE ALPHA 1-6 BRANCHES OF GLYCOGEN PLAY AN IMPORTANT ROLE IN INCREASING THE SOLUBILITY OF THE MOLECULE AND, CONSEQUENTLY, IN REDUCING THE OSMOTIC PRESSURE WITHIN CELLS.

CATALYTIC ACTIVITY: Formation of 1,6-glucosidic linkages of
                                                                                                                                                                                                                                                          SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO KNOWN AS THE ALPHA-AMYLASE FAMILY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             9.1%; Score 270; DB 1; Length 702;
21.9%; Pred. No. 1.6e-11;
Live 90; Mismatches 202; Indels 232;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Glycogen biosynthesis; Transferase; Glycosyltransferase;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        f SIMILARITY.

Y SIMILARITY.

Y SIMILARITY.

4 DF3AA8D365A8FE3 CRC64;
 Chem. 268:7509-7513(1993)
                                                                                                                                                                                                                                                                                                                                                                                                                                                 InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Pfam; PF00128; alpha-amylase; 1. Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           BY
BY
BY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    80443 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                        EMBL; L07956; AAA58642.1; -.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Glycogen storage disease. ACT_SITE 357 357
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  702 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Local Similarity
nes 147; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  188 -HSRPK----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ACT_SITE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Matches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               53
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        191
RELATION DEPT.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        δý
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
```

Search completed: July 15, 2002, 12:24:34 Job time: 386 sec

29f930 streptococc

```
326.5
323.2
323.2
310.5
310.5
310.5
300.5
300.5
300.5
300.5
300.5
300.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
200.5
                                                                                                                                                                                                                                                                                                                                                                                                                                 289
288
286.5
286.5
284
284
 \tag{1}
                                                                                                                     July 15, 2002, 12:24:08 ; Search time 55.94 Seconds (without alignments) 1719.435 Million cell updates/sec
                                                                                                                                                                                                                                          1 MFSFGGNIEKNKGIFKLWAP......KLKKDELIKVNRGVGVYQLE 556
                                                                                                                                                                                                                                                                                                                                                                          562222
                                   Compugen Ltd.
                                                                                                                                                                                                                                                                                                                                                                      Total number of hits satisfying chosen parameters:
                 GenCore version 4.5
Copyright (c) 1993 - 2000 Comp
                                                                                                                                                                                                                                                                                                                                     562222 seqs, 172994929 residues
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             summaries
                                                                                         OM protein - protein search, using sw model
                                                                                                                                                                                                                                                                               BLOSUM62
Gapop 10.0 , Gapext 0.5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   sp_fungi:*
sp_human:*
sp_invertebrate:*
sp_mammal:*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                Post-processing: Minimum Match 0%
Maximum Match 100%
Listing first 45 su
                                                                                                                                                                                                                                                                                                                                                                                                           Minimum DB seq length: 0
Maximum DB seq length: 200000000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  sp_archea:*
sp_bacteria:*
                                                                                                                                                                                                    US-09-298-924-8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                SPTREMBL_19:*
                                                                                                                                                                                                   Title:
Perfect score:
                                                                                                                                                                                                                                                                               Scoring table:
                                                                                                                                                                                                                                          sequence:
                                                                                                                                                                                                                                                                                                                                     Searched:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Database
                                                                                                                            Run on:
```

034587 bacillus su 05943 bacillus st 059008 thermus sp. 097988 streptococc 094086 chlamydia t 025319 caldocellum 02928f5 chlamydia p 02928f5 chlamydia p 02938 streptococc 004196 arabidopsis 037313 sulfolobus 037313 sulfolobus 03733 sulfolobus 04742 zea mays (m 056936 aquifex aeo 056936 aquifex aeo 056936 aquifex aeo 056936 aquifex aeo 026836 chlamydia m 026937 aquifex aeo 029826 chlamydia m 028705 bacillus ha 038705 bacillus ha 097709 clostridium 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce 098706 streptomyce

041742 066936 09PKZ6 09PKZ6 09K7U5 09PFP3 09PFP3 09PFP3 09PFP3 09PFP3 09PFP3 09PFP3 09PFP3

Q59319 Q928F5 Q99XX8 Q04196

093ни3

RESULT Q53641

ID 053641 PRELIMINARY; PRT; 556 AA.	01-NOV-1996 (TrEMBLrel.	01-NOV-1996 (TrEMBLrel.	01-DEC-2001 (TrEMBLrel.	ALPHA-AMYLASE (FRAGMENT)	OS Sulfolobus acidocaldarius.	OC Archaea; Crenarchaeota; Sulfolobales; Sulfolobaceae; Sulfolobus.	OX NCBI_TaxID=2285;		RP SEQUENCE FROM N.A.		RA Kobayashi K., Iwamatsu A.; RI. Suhmitted (SED-1905) to the EMBL/GenBank/DDRI datahases	RP SEQUENCE FROM N.A.			RA Maruta K., Mitsuzumi H., Nakada T., Kubota M., Chaen H., Fukuda S.,	٠,	RT "Cloning and sequencing of a cluster of genes encoding novel enzymes pm of trabalose biosevethesis from thermohilic archaelacterium Gulfolohus			DR EMBL; D64131; BAA11011.1;	ш	Н	_		_	_	DR PROSITE; PS00217; SUGAR_TRANSPORT_2; UNKNOWN_1.	-		SQ SEQUENCE 556 AA; 64373 MW; 4215B45E6C8ED4E7 CRC64;	_
7: sp_mhc:* 8: sp_organelle:*				12: sp_virus:*				17: sp_archeap:*		Pred. No. is the number of results predicted by chance to have a	score greater than or equal to the score of the result being printed, and is derived by analysis of the total score distribution	SUMMARIES	± 4€	Query	No. Score Match Length DB ID Description		1 2594 100.0 556 1 Q53641 Q53641 SUITOLOBUS 2 1784.5 60.4 561 17 PG5867 PG5867 SUITOLOBUS	59,2 559 1 055088	1711.5 57.9 559 1 Q9UWN9	1290 43.7 359 17 Q973Н4	31.9 581 2 Q9ADI5 C	865.5 29.3 583 16 Q9IIVI	28.3 600 16 Q9RX51	26.8 601 16 092063	21.8 217 17 0973H5	16.7 552 2 044528 04452	14.2 440 2 Q93Q35 Q93q3	12.2 652 2 Q59242	707 16 P73608 P736	11.3 1280 16 097507 097s	10 331 11.2 1142 2 093029 293029 bacillus sp

9

```
Pfam: PF00128; alpha-amylase; 1.
Pfam: PF02922; isoamylase_N; 1.
Hydrolase; Glycosidase; Complete proteome.
SEQUENCE 561 AA; 64370 MW; B00E403020F6B242 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  559 AA.
EMBL; AE006815; AAK42272.1; -.
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  PRT;
                                                                                                                                   90;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 535 PKKLKKDELIKVNRGVGVYQL 555
                                                                                                           60.4%;
59.2%;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       01,
03,
19,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | :: : :::| :|:|
PSQITESK-YELDKGFALYKL
                                                                                                                                   Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      01-NOV-1996 (TrEMBLrel.
01-MAY-1997 (TrEMBLrel.
01-DEC-2001 (TrEMBLrel.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Sulfolobus solfataricus.
Archaea; Crenarchaeota;
                                                                                                                      Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            NCBI_TaxID=2287;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ALPHA-AMYLASE
                                                                                                          Query Match
Best Local Simi
Matches 332;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              STRAIN-KM1;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             055088;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  055088
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            3
                                                                                                                                                        m
                                                                                                                                                                                                      62
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    478
                                                                                                                                                                                                                            62
                                                                                                                                                                                                                                                    120
                                                                                                                                                                                                                                                                                                                                                                                            867
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       418
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       542
    g
                                                                                                                                                                                                      δy
                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                       ga
                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Qγ
                                                                                                                                                                                                                                                                                                Qγ
                                                                                                                                                                                                                                                                                                                      셤
                                                                                                                                                                                                                                                                                                                                             δy
                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                RY [1]

RE SEQUENCE FROM N.A.

RY SEQUENCE FROM N.A.

RY STAIN-ATCC 35092 / DSM 1617 / P2;

RX MEDLINE-21332296; PubMed=11427726;

RA AWAYEZ M.J., Confalonieri F., Zivanovic Y., Allard G.,

RA AWAYEZ M.J., Chan-Weiher C.C. T., Clausen I.G., Curtis B.A.,

RA AWAYEZ M.J., Erauso G., Fletcher C., Gordon P.M.K.,

RA Heikamp-de Jong I., Jeffries A.C., Kozera C.J., Medina N., Peng X.,

RA Thi-Woo H.P., Redder P., Schenk M.E., Theriault C., Tolstrup N.,

Charlebois R.L., Doolittle W.F., Duguet M., Gasterland T.,

Charlebois R.L., Doolittle W.F., Duguet M., Gasterland T.,

RA Garrett R.A., Ragan M.A., Sensen C.W., Van der Oost J.;

"The complete genome of the crenarchaeon Sulfolobus solfataricus P2.";

"The Amal. Acad. Sci. U.S.A. 98:7835-7840(2001).
                                     ö
                                                                                                                                                                                                     240
                                                                                                                                                                    480
                                                                                                                      240
                                                                                                                                                                                                                                                               61 IEDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFK 120
                                                                                                                                                       GVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHK 180
                                                                                                                                                                                                                                                 241 WFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIVKDDCGYK 300
                                                                                                                                                                                                                                                                                                IDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPV 360
                                                                                                                                                                                                                                                                                                                                                                                                                                        NIRKRYNNCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGIGFPKKLKK 540
                                     Gaps
                                                                        1 MFSFGGNIEKNKGIFKLMAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYI 60
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          01-MAY-1997 (TrEMBLrel. 03, Created)
01-MAY-1997 (TrEMBLrel. 03, Last sequence update)
01-DEC-2001 (TrEMBLrel. 19, Last annotation update)
ALPHA-AMYLASE PRECURSOR (MALTO-OLIGOSYLTREHALOSE TREHALOHYDROLASE)
(TREZ) (EC 3.2.1.141).
                                                             MFSFGGNIEKNKGIFKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYI
                                                                                                                                                                                                                 TNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYKQLI
                                                                                                                                                                                                    RGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Sulfolobus
                                     ö
               Length 556;
                                     Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Sulfolobales; Sulfolobaceae;
              Score 2954; DB 1;
Pred. No. 4.7e-189;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     561 AA
                                    Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     PRT;
                                     ö
              100.0%;
100.0%;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     541 DELIKVNRGVGVYQLE 556
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  556; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Archaea; Crenarchaeota;
NCBI_TaxID=2287;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Sulfolobus solfataricus
                         Similarity
                          Local
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    P95867
                        Best Loc
Matches
                                                                                                                                                                                                                                                                                                                    301
                                                                                                                                                       121
                                                                                                                                                                                                    181
                                                                                                                                                                                                                           181
                                                                                                                                                                                                                                                                                              301
                                                                                                                                                                                                                                                                                                                                                                 361
                                                                                                                                                                                                                                                                                                                                                                                                                 421
                                                                                                                                                                                                                                                                                                                                                                                                                                        481
                                                                                                                                                                                                                                                                                                                                                                                                                                                              481
                                                                                                                                                                                                                                                                                                                                             361
                                                                                                                                                                                                                                                                                                                                                                                          421
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              RESULT
P95867
                                                                                 q
                                                                                                        ò
                                                                                                                              g
                                                                                                                                                      ò
                                                                                                                                                                          Op
                                                                                                                                                                                                  οy
                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                      a
                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
```

```
EDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKI--EDLIIYELHVGTFSQEGNF 119
                                                                                                                                                                                                        KGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAH 179
                                                                                                                                                                                                                                                                                                                                                             180 KRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVE 239
                                                                                                                                                                                                                                                                                                                                                                                    357
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       477
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                240 YWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIV--KDDC 297
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 SFGGNIEKNKGIFKLWAPYVNSVKLK-LSKKLIPMEKNDEGFFEVEIDDIEENLTYSYII 61
                                                                                                                  Kato M., Kettoku M., Miura Y., Komeda T., Konishi Y., Shindo K., Kobayashi K., Iwamatsu A.; The gene analysis of the new amylases from the hyper thermophilic archae Sulfolobus."; Submitted (SEP-1995) to the EMBL/GenBank/DDBJ databases.
                                                                                                                                                                                                                                                                                              GYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        YYETNPFFFFSDFSDPVLIKGVREGRLKENNOMIDPOSEEAFLKSKLSWKIDEEVLDYYK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        358 APVGDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               QLINIRKRYN-NCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLI--GIGF
    561;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Sulfolobales; Sulfolobaceae; Sulfolobus.
                                                6
    Length
Score 1784.5; DB 17; Lengt
Pred. No. 4.9e-111;
); Mismatches 130; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Created)
Last sequence update)
Last annotation update)
```

5,

```
Pfam; PF00128; alpha-amylase; 1.
                          Hydrolase.
                                      SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  0973Н4
                                                                                                                                                                                                                                                                                                                                                                                                                                          420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           RESULT
Q973H4
    DR
DR
SQ
                                                                                                                                                                                 d
                                                                                                                    ò
                                                                                                                                        g
                                                                                                                                                               ò
                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                       οý
                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                    δý
                                                                                                                                                                                                                                                                                                                       qq
                                                                                                                                                                                                                                                                                                                                                δ
                                                                                                                                                                                                                                                                                                                                                                       В
                                                                                                                                                                                                                                                                                                                                                                                                                 qq
                                                                                                                                                                                                                                                                                                                                                                                                                                          à
                                                                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                  ŝ
                                                                                                                                                                                   EDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFKG 121
                                                                                                                                                                                                                                                                               241
                                                                                                                                                                                                                                                                                        182 GLGVILDVVVNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVEYW 241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               SEQUENCE FROM N.A.
Weiting Y., Wei C., Hui W., Li L., Cheng J.;
Weiting Y., Wei C., Hui W., Li L., Cheng J.;
"Maltooligosyl trehalose trehalohydrolase from Sulfolobus shibatae.";
Submitted (NOV-1999) to the EMBL/GenBank/DDBJ.databases.
EMBL, AF201335; AAF17553.1; -
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                               122 VIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKR 181
                                                                                                                                                                                                                                            242 FKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIV--KDDCGY 299
                                                                                                                                                                                                                                                                                                                                                301
                                                                                                                                                                                                                                                                                                                                                                       KIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAP 359
                                                                                                                                                                                                                                                                                                                                                                                   302 NIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSUFRRKTHGEP 361
                                                                                                                                                                                                                                                                                                                                                                                                                  VGDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYY 419
                                                                                                                                                                                                                                                                                                                                                                                                                               ETINPFFFFSDFSDPVLIKGVREGRLKENNOMIDPQSEEAFLKSKLSWKIDEEVLDYYKQL 479
                                                                                                                                                                                                                                                                                                                                                                                                                                                                           INIRKRYN-NCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGI--GFPK 536
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   541
                                                                                                                   Gaps
                                                                                                                                        61
                                                                                                                                                              61
                                                                                                                                                   SFGGNIEKNKGIFKLWAPYVNSVKLK-LSKKLIPMEKNDEGFFEVEIDDIEENLTYSYII
                                                                                                                                                                                                                                                                              182 GIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYW
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  482 IKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSFPQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Archaea; Crenarchaeota; Sulfolobales; Sulfolobaceae; Sulfolobus
NCBI_TaxID=2286;
                                                                                                                  7;
                                                                                              559;
                                                                                          59.2%; Score 1748.5; DB 1; Length ilarity 58.9%; Pred. No. 1.2e-108; Conservative 87; Mismatches 136; Indels
EMBL; D64130; BAA11010.1; -.
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR0004193; isoamylase_N.
Pfam; PF00128; alpha-amylase_N.
Pfam; PF002922; isoamylase_N; 1.
SEQUENCE 559 AA; 64790 MW; 79FBE23A7CD38B4E CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           01-MAY-2000 (TrEMBLrel. 13, Created)
U-MAY-2000 (TrEMBLrel. 13, Last sequence update)
01-DEC-2001 (TrEMBLrel. 19, Last annotation update)
MALTOOLIGOSYL TREHALOSE TREHALOHYDROLASE.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Ā
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PRT:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      542 HIEEGK-YEFDKGFALYKL 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       537 KLKKDELIKVNRGVGVYQL 555
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Sulfolobus shibatae
                                                                                          Query Match .
Best Local Similarity
Matches 329; Conserv
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Q9UWN9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   6NM1160
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  4
                                                                                                                                                                                                                                                                                                                                                                      300
                                                                                                                                                                                                                                                                                                                                                                                                                                         362
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           480
                                                                                                                                        ٣
                                                                                                                                                                                      62
                                                                                                                                                                                                          62
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   422
                                                                                                                                                                                                                                                                                                                                                                                                                  360
                                                                                                                                                                                                                                                                                                                                                                                                                                                               420
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                RESULT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           6NMD60
   à
                                                                                                                                                          g
                                                                                                                                                                                   ò
                                                                                                                                                                                                         g
                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                      셤
                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                 q
                                                                                                                                                                                                                                                                                                                       ά
                                                                                                                                                                                                                                                                                                                                            g
                                                                                                                                                                                                                                                                                                                                                                     ογ
                                                                                                                                                                                                                                                                                                                                                                                        셤
                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
```

```
STRAIN-JCM 10545 / 7;

PubMed-11572479;

Rawarabbayasi Y., Hino Y., Horikawa H., Jin-no K., Takahashi M.,
Sekine M., Baba S.-I., Ankai A., Kosugi H., Hosoyama A., Fukui S.,
Nagai Y., Nishijina K., Otsuka R., Nakazawa H., Takamiya M., Kato Y.,
Yoshizawa T., Tanaka T., Kudoh Y., Yamazaki J., Kushida N., Oguchi A.,
Aoki K.-I., Masuda S., Yanagii M., Nishimura M., Yamagishi A.,
Oshima T., Kikuchi H.;
                                                                                                                                                                                                                                                                                         241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   299
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 419
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       479
                                                                                                                                                                                                                                                                  EDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFKG 121
                                                                                                                                                                                                                                                                                                                                                                        301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  300 KIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAP 359
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           361
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        422 EQKPFYFFSDFSDTKLIQGLREGRKKENGODTDPQDESTFNASKLSWKIDEEIFSFYKIL 481
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          541
                                                                                                                                                                                                                                                                                                                                                   122 VIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKR 181
                                                                                                                                               Gaps
                                                                                                                                                                                     61
                                                                                                                                                                                                                            61
                                                                                                                                                                                                                                                                                                                                                                                                                                                          2 TFGYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDDKGYFTITLNNVKVGDRYKYVL
                                                                                                                                                                                                                                                                                                                                                                                                                                    182 GIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYW
                                                                                                                                                                                     SFGGNIEKNKGIFKLWAPYVNSVKLK-LSKKLIPMEKNDEGFFEVEIDDIEENLTYSYII
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   242 FKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIV--KDDCGY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ETNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYKQL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               480 INIRKRYN-NCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGI--GFPK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 360 VGDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Archaea; Crenarchaeota; Sulfolobales; Sulfolobaceae; Sulfolobus.
                                                                                                                                            7;
                                                                                                      559;
                                                                                                      Length
                                                                                                                                            Indels
                                          CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         Last sequence update)
Last annotation update)
                                                                                                      DB 1;
                                                                                                98; Score 1711.5; DB 1
08; Pred. No. 3.6e-106;
87; Mismatches 141;
                                        8C0F0F38A5AE2846
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                359
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Created)
                                        64619 MW;
                                                                                                    57.9%;
58.0%;
Pfam; PF02922; isoamylase_N;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          542 HIEEGQ-YEFDKGFALYKL 559
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 537 KLKKDELIKVNRGVGVYQL 555
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      19,
19,
                                                                                           Query Match
Best Local Similarity 58.09
Matches 324; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             097314;
01-DEC-2001 (TFEMBLrel. 1)
01-DEC-2001 (TFEMBLrel. 1)
01-DEC-2001 (TFEMBLrel. 1)
PUTATIVE ALPHA-AMYLASE.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Sulfolobus tokodaii
                                        559 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               NCBI_TaxID=111955;
```

```
Pseudomonas
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       0911V1;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Q911V1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   124
                                                                                                                                                                                                                                                                 15
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 62
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              115
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       296
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             354
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                355
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               412
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             RESULT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             pp
                                                                                                                                                                                                                                                                                                                                           q
                                                                                                                                                                                                                                                                                                                                                                                                                              ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                QΥ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                HD DTT ACCOOR OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF THE BEACH OF T
                                                                                                                                                                                                                                                                                                                                                                                                                              ;;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         440
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SPRHILQDIAELSHSLGKFVIAESDLNDPKIIDDKCGYKIDAQWVDDFHHSVHAYLTGE 120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               for
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            LLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKTFKIDGLRLDAVHAIFD 260
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              261 NSPKHILQEIAEKAHQLGKFVIAESDLNDPKIVKDDCGYKIDAQWVDDFHHAVHAFITKE 320
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               321 KDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPVGDLPPRKFVVFIQNHDQVGN 380
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      441 EGREKENNOMIDPQSEEAFLKSKLSWKIDEEVLDYYKQLINIRKRY-NNCKRVKEVRRG 499
                                                                                                                                                                                                                                                                                                                                                                                                                              Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Redenbach M., Kleser H.M., Denapaite D., Eichner A., Cullum J., Kinashi H., Hopwood D.A.;
Kinashi H., Hopwood D.A.;
A set of ordered cosmids and a detailed genetic and physical map the 8 Mb Streptomyces coelicolor A3(2) chromosome.";
Mol. Microbiol. 21:77-96(1996).
EMBL; AL589708; CAG33923.1;
InterPro; IPR000461; Alpha_amylase.
Pfam; PF00128; alpha_amylase.
SEQUENCE 581 AA; 63952 MW; 0816DFF3BC1A3408 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         RGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Streptomyces coelicolor.

Bacteria; Firmicutes; Actinobacteria; Actinobacteridae;
Actinomycetales; Streptomycineae; Streptomycetaceae; Streptomyces.
NCBI_TaxID=1902;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                500 NCITLIMEKIGIIASFDDIVINSKITGNLLIGIG-FPKKLKKDELIKVNRGVGVYQ 554
                                                                                                                                                                                                                                                                                                                                               Length 359;
"Complete genome sequence of an aerobic thermoacidophilic Crenarchaeon, Sulfolobus tokodaii strain7."; MAR Res. 8:123-140(2001).
EMBL; AB000984, BAB65393.1; --.
Hypothetical protein; Complete proteome.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           STRAIN-A3(2);
Cerdeno A.W., Parkhill J., Barrell B.G., Rajandream M.A.;
Submitted (MAR-2001) to the EMBL/GenBank/DDBJ databases.
                                                                                                                                                                                                                                                                                                                                                                                                                              66; Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Seeger K.J., Harris D.,
Submitted (MAR-2001) to the EMBL/GenBank/DDBJ databases.
                                                                                                                                                                          11 protein; Complete proteome.
359 AA; 41600 MW; 4D9F429099E81665 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Last sequence update)
Last annotation update)
                                                                                                                                                                                                                                                                                                                                       43.7%; Score 1290; DB 17;
66.0%; Pred. No. 2.6e-78;
11ve 53; Mismatches 66;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           581
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Created)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        STRAIN-43(2);
MEDLINE-97000351; PubMed-8843436;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          09aDI5 PRELIMINARY;
09ADI5;
01-JUN-2001 (TrEMBLEE1. 17, Cr
01-JUN-2001 (TrEMBLEE1. 17, La
01-OCT-2001 (TrEMBLEE1. 18, La
PUTATIVE ALEHA AMYLASE.
                                                                                                                                                                                                                                                                                                                                                                                                                              Conservative
                                                                                                                                                                                                                                                                                                                                                                              Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              STRAIN-A3(2);
                                                                                                                                                                                                                                                                                                                                       Ouery Match
Best Local Simil
Matches 235; C
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           SCBAC1A6.02C
                                                                                                                                                                                                                 SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  121
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     381
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         241
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          301
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       99ADIS

909ADIS

                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            RESULT
        RT RT SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW SO KW 
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  οý
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
```

```
10;
                                                                                                                                                                                                                                      EKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGI 183
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGR--IEDIEKTFKDVFVYDGKYSRYRG 353
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           RTHGAPV--GDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPL 411
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      73 RYQPLGVHDKSQLIRTDYQILDLGKV------KIEDLIIYELHVGTFSQEGNFKGVI 123
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     RSHGRALDRGRVAAHRLTGYSQTHDQVGNRAQGDRLASLVSPGLAACAATLTLTAPFTPM 414
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         IFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKE------NNQMIDPQSEEAFLKSKL 464
                                                        Gaps
                                                                                                                                                       61
                                                                                                      FKLWAPYVNSVKLKLSKKLIPMEKNDE--GFFEVEIDDIEENLTYSYIIEDKREIPDPAS 72
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Stover C.K., Pham X.-O.T., Erwin A.L., Mizoguchi S.D., Warrener P., Hickey M.J., Brinkman F.S.L., Hurnagle W.O., Kowallik D.J., Lagrou M. Garber R.L., Goltry L., Tolentino E., Westbrock-Wadman S., Yuan Y., Brody L.L., Coulter S.N., Folger K.R., Kas A., Larbig K., Lim R.M., Smith K.A., Spencer D.H., Wong G.K.-S., Wu Z., Paulisen I.T., Reizer J., Saier M.H., Hancock R.E.W., Lory S., Olson M.V.; "Complete genome sequence of Pseudomonas aeruginosa PAOI, an
                                                                                                                                       184 AVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFK
                                                                                                                                                                                                                                                                                                                                                                                                                                                244 TFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGK-----FVIAESDLNDPKIV--KD
                                                      43:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Bacteria; Proteobacteria; gamma subdivision; Pseudomonadaceae;
     Length 581;
                                                      Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             01-MAR-2001 (TrEMBLrel. 16, Created)
01-MAR-2001 (TrEMBLrel. 16, Last sequence update)
01-OCT-2001 (TrEMBLrel. 18, Last annotation update)
PROBABLE GLYCOSYL HYDROLASE.
Score 942.5; DB 2;
Pred. No. 7.5e-55;
3; Mismatches 174;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             583 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     opportunistic pathogen.";
Nature 406:959-964(2000).
EMBL; AE004643; AAG05552.1; -.
InterPro; IPR002086; Aldehyde_dehydr.
InterPro; IPR000461; Alpha_amylase.
Pfam; PF00128; alpha-amylase; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      SEQUENCE FROM N.A. STRAIN-ATCC 15692 / PAO1; MEDLINE-20437337; Pubmed-10984043;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             465 SWKIDE----EVLDYYKQLINIR 483
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           93;
  31.9%;
                                                      Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Pseudomonas aeruginosa
                           Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      NCBI_TaxID=287;
  Query Match
Best Local Simi
Matches 194;
```

us-09-298-924-8.rspt

Ŋ

```
Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               092063
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    6
                                                                                                                                               Matches
                                                                                                                                                                                                                                                                                                                                   192
                                                                                                                                                                                                                                                                                                                                                                                      251
  pp
                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         a
                                                                                                                                                                                                                           Q
                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                         qq
                                                                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                                                                                                               g
                                                                                                                                                                                                                                                                                                                                                                                                                                            δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                           20;
                                                                                                                                                                                                                                                                                                                                                                                      344
                                                                                                                                                                       62 EDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKV--KIE------DLIIYELHVG 111
                                                                                                                                                                                       112 TFSQEGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWEL 171
                                                                                                                                                                                                                                        119 LF---GSYAEVERFLPRLVELGVTAVELMPLGEFPGRRNWGYDGVLPFAPASAYGTPEDL 175
                                                                                                                                                                                                                                                                                                                                 285
                                                                                                                                                                                                                                                                                                                                              290 DDNRASLLRQ--GY--DAQWNDDGHHALHVLLTGENDGYYQDYPEPLRCLARCLAEGFVY 345
                                                                                                                                                                                                                                                                                                                                                                                                                                         DGKYSRYRGRIHGAPVGDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYI 404
                                                                                                                                                                                                                                                                                                                                                                                                                                                       405 LSPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRLKENNQ-------MID 452
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Gaps
                                                                                                                                              65
                                                                                                                    4 FGGNIEKN-KGIFKLWAPYVNSVKLKLSK-KLIPMEKNDEGFFEVEIDDIEENLTYSYII 61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               MEDLINE=20036896; PubMed=10567266;
White O., Eisen J.A., Heidelberg J.F., Hickey E.K., Peterson J.D.,
Dodson R.J., Haft D.H., Gwinn M.L., Nelson W.C., Richardson D.L.,
Moffat K.S., Qin H., Jiang L., Pamphile W., Crosby M., Shen M.,
Vamathevan J.J., Lam P., McDonald L., Qitterback T., Zalewski C.,
Makarova K.S., Aravind L., Daly M.J., Winton K.W., Fleischmann R.D.
Ketchum K.A., Nelson K.E., Salzberg S., Smith H.O., Venter J.C.,
                                                                                                                                                                                                                                                                             RKFILENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAH-----QLGKFVIAES
                                                                                                                                                                                                                                                                                                                                                                                      DLNDPKIVKDDCGYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGR-IEDIEKTFKDVFVY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Thermus/Deinococcus group; Deinococcales; Deinococcus.
                                                                                           67;
                                                                  Length 583;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Genome sequence of the radioresistant bacterium Deinococcus
                                                                                           Indels
                        651CD7A918833E00 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              01-MAY-2000 (TFEMBLrel. 13, Last sequence update) 01-DEC-2001 (TFEMBLrel. 19, Last annotation update) MALTOOLIGOSYLTREHALOSE TREHALOHYDROLASE, PUTATIVE.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | : | | : | | : | : | 464 PNAVETFERSRPGLADCDPAWR-----GFYRQLLEIRHEH 498
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                PQSEEAFLKSK-----LSWKIDEEVLDYYKQLINIRKRY 486
                                                                DB 16;
                                                               29.3%; Score 865.5; DB 16; 38.2%; Pred. No. 1e-49; iive 89; Mismatches 166;
PS00070; ALDEHYDE_DEHYDR_CYS; UNKNOWN_1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          600 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Created)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            PRT;
           Hydrolase; Complete proteome.
SEQUENCE 583 AA; 65657 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  01-MAY-2000 (TrEMBLrel. 13, 01-MAY-2000 (TrEMBLrel. 13, 01-DEC-2001 (TrEMBLrel. 19,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Science 286:1571-1577(1999).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 EMBL; AE001905; AAF10042.1;
                                                                                         Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Deinococcus radiodurans
                                                                              Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                NCBI_TaxID=1299;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Fraser C.M.;
                                                                             Best Local Sim;
Matches 199;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        radiodurans
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Bacteria;
                                                                Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Q9RX51;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          09RX51
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        DR0464
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                æ
                                                                                                                                                                                               99
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               453
                                                                                                                                                                                                                                                                                                                                                                                    286
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                RESULT
Q9RX51
NW
SO
                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ò
                                                                                                                                                                                                                                                g
                                                                                                                                                                                                                                                                                                    a
                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                   ò
                                                                                                                                                                                                                                                                                                                                                                                                                                         ð
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            à
```

```
12;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  273 RLDATPYMTDDSETHILTELAQEIHELGGTHLLLAEDHRNLPDLVTVN----HLDGIWTDD 329
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |||| : | : | ||| || 450 FFSDHAGE-LGQAVSEGRKKEFGGFSGFSGFDVPDPQAEQTFLNSKLNWAEREGGEHART 508
                                                                                                                                                                                                                                                                                                                                                                75 QPLGVHDKSQLI----RTDYQILDLGKVKIEDLIIYELHVGTFSQEGNFKGVIEKLDYLKD 131
                                                                                                                                                                                                                                                                                                                                                                                         NHIGPEGNYLLGLGP-YFSDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKTFKIDGL 250
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                RLDAVHAIFDNSPKHILQEIAEKAHQLG--KFVIAESDLNDPKIVKDDCGYKIDAQWVDD 308
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         309 FHHAVHAFITKEKDYYYQDF-GRIEDIEKTFKDVFVYDGKYSRYRGRTH--GAPVGDLPP 365
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                330 FHHETRVTLTGEQEGYYAGYRGGAEALAYTIRRGWRYEGQFWAVKGEEHERGHPSDALEA 389
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Finan T.M., Weidner S., Wong K., Buhrmester J., Chain P., Vorhoelter F.J., Hernandez-Lucas I., Becker A., Cowie A., Gouzy J., Golding B., Puehler A.; "The complete sequence of the 1,683-kb pSymB megaplasmid from the N2-fixing endosymbiont Sinorhizobium meliloti.";
                                                                                                                                                                                                                                                                                                                                                                                                                                                       132 LGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIAVILDVVY 191
                                                                                                                                                                                                                                                                                                                    95
                                                                                                                                                                                                                                    Gaps
                                                                                                                                                                                                                                                                           15 FKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYIIEDKREIPDPASRY 74
                                                                                                                                                                                                                                                                                                         366 RKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYYETNPFF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   426 FFSDFSDPVLIKGVREGRLKE-----NNOMIDPOSEEAFLKSKLSWKIDE----EV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Plasmid pSymB (megaplasmid 2).
Bacteria; Proteobacteria; alpha subdivision; Rhizobiaceae group;
Rhizobiaceae; Sinorhizobium.
                                                                                                                                                                                                                                31;
                                                                                                                                                                                       Length
                                                                                                                                                                                                                                    191; Indels
                                                                                                                      594091EC093F8A44 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   01-DEC-2001 (TrEMBLrel. 19, Created)
01-DEC-2001 (TrEMBLrel. 19, Last sequence update)
01-DEC-2001 (TrEMBLrel. 19, Last annotation update)
PUTATIVE 1,4-ALPHA-GLUCAN BRANCHING ENZYME PROTEIN
                                                                                                                                                                                    28.3%; Score 835.5; DB 16; 36.8%; Pred. No. 1.1e-47;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Ā
                                                                                                                                                                                                                                89; Mismatches
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Rhizobium meliloti (Sinorhizobium meliloti)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              601
TIGK; DKU404;
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 SEQUENCE FROM N.A.
STRAIN=1021;
MEDLINE=21396508; PubMed=11481431;
                                                  Pfam; PF00128; alpha-amylase; 1.
Pfam; PF002922; isoamylase_N; 1.
Hydrolase; Complete proteon's
SEQUENCE 600 AA; 66909 WW; 5
                                                                                                                                                                                                                                  181; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       473 LDYYKQLINIRK 484
                                                                                                                                                                                                             Local Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                509 LRLYRDLLRLRR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     NCBI_TaxID=382;
```

```
Bacteria;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        amylases.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Sato N.;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   244528;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         044528
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               11
                                                                                                                                                                                                                                                                                                  63
                                                                                                                                                                                                                                                                                                                                            9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             180
       DR
SQ
                                                                                                                                                                                                                                                                                                                                         셤
                                                                                                                                                                                                           ŏ
                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                               δ
                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                  a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           δy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                      15;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   STRAIN-JCM 10545 / 7;
PubMed=11572479;
Rawarabayasi Y., Hino Y., Horikawa H., Jin-no K., Takahashi M.,
Sekine M., Baba S.-I., Ankai A., Kosugi H., Hosoyama A., Fukui S.,
Nagai Y., Nishijima K., Otsuka R., Nakazawa H., Takamiya M., Kato Y.,
Yoshizawa T., Tanaka T., Kudoh Y., Yamazaki J., Kushida N., Oguchi A.,
Aoki K.-I., Masuda S., Yanagii M., Nishimura M., Yamagishi A.,
Complete genome sequence of an aerobic thermoacidophilic
Crenarchaeon, Sulfolobus tokodaii strain?";
DNA Res. 8:123-140(2001).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Gaps
                                                                                                                                                                                                                                                                                                                                       62 EDKREIPDPASRYQPLGVHDKSQLI---RTDYQILDLGKVKIEDLIIYELHVGTFSQEGN 118
                                                                                                                                                                                                                                                                                                                                                                               72 ADGTEVADPASSAQEREASGTSIVVDHAAYEWQTSSWRGRPWEEAVISELHVGCFTPEGT 131
                                                                                                                                                                                                                                                                                                                                                                                                                             FKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEA 178
                                                                                                                                                                                                                                                                                                                                                                                                                                                          238 VEYWFKTFKIDGLRLDAVHAIFDNSPKHIL----QEIAEK-AHQLGKFVIAESDLNDPKI 292
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            249 ALYWLGHFRFDGLRLDATEQIRDTTKPHFLVALEHEVREAFAERQIHLVLEDAHRRSLL 308
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            GKYSRYRGRTHGAPVGD---LPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATL 402
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     YILSPYIPLIFMGEEYYETNPFFFFSDFSDPVLIKGVREGRL------KENNQM 450
                                                                                                                                                                                                                                                                          |:|| |: |:|||| | : |:|||| | | | : | | |:|||: | : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : : | : : : | : : : | : : : | : : : : | : : : | : : : | : : : : | : : : : | : : : | : : : | : : : | : : : | : : : | : : : | : : : :
                                                                                                                                                                                                                                                3 SFGGN-IEKNKGIFKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYII 61
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           HKRGIAVILDVVYNHIGPEGNYLLGLGP-YFSDRYKTPWGLTFNFDDRGCDQVRKFILEN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      293 VKDDCGYKI--DAQWVDDFHHAVHAFITKEKDYYYQDF----GRIEDIEKTFKDVFVYD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Proc. Natl. Acad. Sci. U.S.A. 98:9889-9894(2001).
EMBL; AL603646; CAC49676.1; -.
Transferase; Glycosyltransferase; Plasmid; Hypothetical protein;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Sulfolobus tokodaii.
Archaea; Crenarchaeota; Sulfolobales; Sulfolobaceae; Sulfolobus.
                                                                                                                                                          601;
                                                                                                                                                          Length
                                                                                                                                                        26.8%; Score 792.5; DB 16; Length
36.9%; Pred. No. 8e-45;
.ive 79; Mismatches 199; Indels
                                                                                        024DA322A7B72C2E CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Last sequence update)
Last annotation update)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         451 IDPQSEEAFLKSKLSWK-----IDEEVLDYYKQLINIRKRY 486
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        217
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Created)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      PRT;
                                                                                        66954 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  19,
19,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    0973H5;
01-DEC-2001 (TrEMBLrel. 1
01-DEC-2001 (TrEMBLrel. 1
01-DEC-2001 (TrEMBLrel. 1
PUTATIVE ALPHA-AMYLASE.
ST0926.
                                                                                                                                                                                                      Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      PRELIMINARY;
                                                                                           601 AA;
                                                                                                                                                                               Similarity
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        NCBI_TaxID=111955;
                                                                   Complete proteome
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SEQUENCE FROM N.A.
                                                                                                                                                                               Best Local Sim
Matches 192;
                                                                                                                                                          Query Match
Best Local 8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         179
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               346
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      479
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          RESULT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Q973H5
  S KW CR
                                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                                       ò
                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                             ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              QQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      δλ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ŏ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
```

```
4;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     26;
                                                                                                                                                                                                                                                                                                                                      67 QWVDVTDPYATDIDESSGKDNSIARIKDGEKIVDTYVWQHDDKPLPADHELVIYELHVGD 126
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         165
                                                                                                                                                                                                                                                                                                             DKREIPDPASRYQPLGVHDKSQLIRTDYQILDLG-KVKIEDLIIYELHVGTFSQEGNFKG 121
                                                                                                                                                                                                                                                                                                                                                                                                        122 VIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKR 181
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            -----LIIYELHVGT 112
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 --GPEGNYLLGLG 205
                                                                                                                                                                      Gaps
                                                                                                                                                                                                                4 FGGN-IEKNKGIFKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVEIDDIEENLTYSYIIE 62
                                                                                                                                                                                                                                        2 FGPSFLSENEVEFILMAPYQKKATLRLNEEKYDMEKDEKGYFRITV-NAKEGDKYSFII- 59
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 15 FKLWAPYVNSVKLKLS---KKLIPMEKNDEGFFE--VEIDDIEENL----TYSYIIEDK 64
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      "Cloning of a low-temperature-induced gene lti2 from the cyanobacterium Anabaena variabilis M3 that is homologous to alpha-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             FS-----QEGNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTY
                                                                                                                                                                      4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Indels 178;
                                                                                                                     Length 217;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Cyanobacteria; Nostocales; Nostocaceae; Anabaena
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Length 552;
                                                                                                                                                                    Indels
EMBL; AP000984; BAB65938.1; -.
Hypothetical protein; Complete proteome.
SEQUENCE 217 AA; 25181 MW; 4A1235EC5B491CEF CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  63833 MW; 069886FAFD8FC411 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      01-NOV-1996 (TrEMBLrel. 01, Last sequence update)
01-DEC-2001 (TrEMBLrel. 19, Last annotation update)
101-DEC-2001 (TrEMBLREL. 19, Last annotation update)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   76; Mismatches 142;
                                                                                                                   Score 645; DB 17;
Pred. No. 1.4e-35;
'; Mismatches 44;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         65 R--EIPDPASR--YQPLGVHDKSQLIRTDYQILDLGKVKIED-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Score 493; DB 2;
Pred. No. 6.8e-25;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       552 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 166 GGPWELAKLVNEAHKRGIAVILDVVYNHI------
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Query Match 16.7%; Score 493; Best Local Similarity 28.6%; Pred. No. 6. Matches 159; Conservative 76; Mismatche
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             182 GIAVILDVVYNHIGPEGNYLLGLGPYF 208
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   01, Created)
01, Last seq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 EMBL; X59279; CAA41970.1; -
InterPro; IPR000461; Alpha_amylase.
InterPro; IPR004193; isoamylase_N.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Plant Mol. Biol. 18:165-170(1992).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          MEDLINE=92119230; PubMed=1731972;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Pfam; PF00128; alpha-amylase; 1.
Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                               37;
                                                                                                                     21.8%;
58.9%;
                                                                                                                     Query Match 21.89
Best Local Similarity 58.99
Matches 122; Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   01-NOV-1996 (TrEMBLrel. 01-NOV-1996 (TrEMBLrel.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Transferase; Hydrolase.
SEQUENCE 552 AA; 638
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Anabaena variabilis
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                NCBI_TaxID=1172;
```

à 셤 ò g ò a ò a ò g οy 8

```
IAS-----NDSGR--DMNS-----VRNAITQRYSGR-HTAR-----VIYSESHDE 390
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      4 FGGNIEKNKG----IFKLWAPYVNSVKL-------KLSKKLIPMEKNDEGFFEVE 47
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            STRAIN=TRBE14;

BEDLINE-29531021; PubMed=7944355;
Takata H., Takaha T., Kuriki T., Okada S., Takagi M., Imanaka T.;

"Properties and active center of the thermostable branching enzyme
                                                        TKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPVGDLPPRKFVVFIQNHDQ
                                                                                                                                                         -!- SIMILARITY: BELONGS TO FAMILY 13 OF GLYCOSYL HYDROLASES, ALSO KNOWN AS THE ALPHA-AMYLASE FAMILY.

EMBL; D87026; BAA19588-1; --
InterPro; IPRO0461; Alpha_amylase.

InterPro; IPRO044193; isoamylase_N.

Pfam; PF00128; alpha-amylase; 1.

Pfam; PF00128; sloamylase, 1.
                                                                                                                                   -----GNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEEYYE 420
                                                                                                                                                                                                                                                                               Q59242; 008511; 008485; 01. Created)
01-NOV-1996 (TrEMBLrel. 01, created)
01-NOV-1996 (TrEMBLrel. 01, Last sequence update)
01-BC-2001 (TrEMBLrel. 19, Last annotation update)
1,4-ALPHA-GLUCAN BRANCHING ENZYME (EC 2.4.1.18)
6GLYCOGEN BRANCHING ENZYME) (1,4-ALPHA-GLUCAN BRANCHING ENZYME)
(AMXLO-(1,4 TO 1,6)-TRANSGLYCOSICASE).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              O.F
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                -!- PATHWAY: THIRD STEP IN GLYCOGEN BIOSYNTHESIS.
-!- MISCELLANEOUS: OPTIMAL ACTIVITY AT APPROXIMATELY 39 DEGREES
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Takata H., Takaha T., Okada S., Takagi M., Imanaka T.;
Submitted (APR-1997) to the EMBL/GenBank/DDBJ databases.
-!- CATALYTIC ACTIVITY: FORMATION OF 1,6-GLUCOSIDIC LINKAGES
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Length 652;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Indels
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Glycogen biosynthesis; Transferase; Glycosyltransferase. ACT_SITE 308 308 BY SIMILARITY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Submitted (AUG-1996) to the EMBL/GenBank/DDBJ databases.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            f SIMILARITY.

SIMILARITY.

SIMILARITY.

4591EB414A0E3FEF CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                      Bacillus stearothermophilus.
Bacteria; FirmLoutes; Bacillus/Clostridium group;
Bacillus/Staphylococcus group; Geobacillus.
NCBL_TaxID=1422;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   186;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            12.2%; Score 360; DB 2; 25.3%; Pred. No. 6.3e-16;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                from Bacillus stearothermophilus."; Appl. Environ. Microbiol. 60:3096-3104(1994)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Mismatches
                                                                                                                                                                                                                                                                   652
                                                                                                                                                                                                                                                                   PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             72;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   76793 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Local Similarity 25.3 les 142; Conservative
                                                                                                                                                                                                                                                                   PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   652 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       STRAIN-TRBE14;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             STRAIN=TRBE14;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Query Match
Best Local S
Matches 142
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ACT_SITE
ACT_SITE
SEQUENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Takata H.
                   297
                                                                                              354
                                                                                                                                                                                                                             RESULT
                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                      a
                                                                                                                                 Ω
                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              17;
                                                                              262 SPKH-ILQEIAEKAHQLGKFVIAE-----SDLNDPKIVKDDCGYKIDAQWVDDFHHA 312
                                                                                                                                                                                                          VHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHGAPVGDLPPRKFVVFI 372
                                                                                                                                                                                                                                                                                 QNHD-----QVGNRGNGERLSILTDK-----TTYLMAATLYILSPYIPLIFMGEEY 418
                                                                                                                                                                                                                                                                                                                                                           YETNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSW-----KIDEEVL 473
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            112 TFSQE-----GNFKGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYG 166
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    167 GPWELAKLVNEAHKRGIAVILDVVYNHIGP-----EGNYLLGLGPYFSD--RYKTPW 216
                                                                                                                                                                                                                                                                                                                    377 INHDHDHIMVELGNR-----EIFHDEAFRRAKLGTAILMTAV-----GVPLIWMGEEF 424
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ------FNEMIIYEMHVG 118
                                                                                                                                                                                                                                                                                                                                                                                                 -----SKIDWTLLGNDLNRSLF 451
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 52 EENLTYSYIIEDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVG 111
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          264 KHILQEIAEKAHQLGKFVIAESDLNDPKIVKDDC-----GYKIDAQWVDDFHHAVHAFI 317
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            52; Mismatches 129; Indels 102; Gaps
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          PYFSDRYKTPWGLTFNFD--DRGCD--QVRKFILENVEYWFKTFKIDGLRLDAVHAIFDN
                                                                                                                                                                   ------MDGCWHDSFYHT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SEQUENCE FROM N.A.

Ucki T., Incuye S.;

Udentification of a new His-Asp phosphorelay signal transduction system which regulates expression of a heat shock gene, lonb, of Myxococcus xanthus.";

Submitted (JUL-2000) to the EMBL/GenBank/DDBJ databases.

EMBL; ARS18783; A40

NON_TER 440 A4, 48064 MM; 8D492EA5A4A92017 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ---AIFD--NSP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Length 440;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Bacteria; Proteobacteria; delta subdivision; Myxobacteria; Myxococcales; Cystobacterineae; Myxococcaceae; Myxococcus.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 GLTFNFDDRGCDQVRKFILENVEYWFKTFKIDGLRLDAVH------
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       01-DEC-2001 (TrEMBLrel. 19, Created)
01-DEC-2001 (TrEMBLrel. 19, Last sequence update)
01-DEC-2001 (TrEMBLrel. 19, Last annotation update)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      14.2%; Score 420; DB 2; 32.0%; Pred. No. 3.7e-20;
                                                                                                                                                                   291 DFMHWIAQEAKKTAGAKPFYNVAEHIPETTSIINLDGP-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       440 AA.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    80 QENSTGSSIIYDHGEYWWNAQQYSSPG-----
                                                                                                                                                                                                                                                                                                                                                                                                 --KQQDQ---
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PRT;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  BRANCHING ENZYME GLGB (FRAGMENT).
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Conservative
                                                                                                                                                                                                                                                                                                                                                                                                                                  474 DYYKQLINIRKRYNN 488
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DYHKGLIGLRK--NN 464
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Myxococcus xanthus.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Best Local Similarity
Matches 133; Conserv
                                                                                                                                                                                                                                                                                                                                                                                               GEYKP----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             NCBI_TaxID-34;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Query Match
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      093035
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                12
                                                                                                                                                                                                        313
                                                       206
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     452
                 187
                                                                                                                                                                                                                                                                                 373
                                                                                                                                                                                                                                                                                                                                                                                               425
                                                                                                                                                                                                                                                                                                                                                         419
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                RESULT
```

293035

g

õ

g

ò

g

ογ g ò

ò

25;

ω

29;

Gaps

207:

197; Indels

Mismatches

83;

Conservative

```
Matches 146;
                                                                                                          g
                                                                                                                                                                                                                       q
                                                                                                                                                                                                                                                                              οy
                                                                                                                                                                                                                                                                                                                                     g
                                                                                                                                                                                                                                                                                                                                                                                                                                            q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            С
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Dp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           qq
                                                            ò
                                                                                                                                                                   ŏ
                                                                                                                                                                                                                                                                                                                                                                                           δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          QΥ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      P
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Db
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Qγ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               s:
                                                                                                                                                                                                                                                                                                                                     255
                                                                                                                                                                                                                                                                                                                                                              316 WPNNDRLYENPYAVEFLRKLNEAVFAYDPNALMIAEDSTDWPKVTAPTYEGGLGFNYKWN 375
                                                                                                          147
                                                                                                                                            NRDWGYDGVFLYAVQNTYGGPWELAKLVNEAHKRGIAVILDVVYNHI--GPEGNYLLGLG 205
                                                                                                                                                                                                                                                                                                                                                                                                                                               ----HAIFDNS-PKHILQEIAEK--AHQLGKFVIAESDLNDPKIVKD-----DCGYKID 302
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    353 GRTHGAPVGDLPPRKFVVFIQNHDQVGNRGNG---ERLSILTDKTTYLMAATLYILSPYI 409
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              410 PLIFMGEEYYETUPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSW--- 466
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         AQWVDDF------HHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYR 352
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             376 MGWMNDMLKYMETPPYERRHVHNQVTFSLLYAYS----ENFILPFSHDEVVHGKKS--- 427
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          -----AQFDEWKFEDELDWVLF 482
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            SEQUENCE FROM N.A.
MEDLINE-97061201; PubMed-8905231;
MEDLINE-97061201; PubMed-8905231;
KAROKO T., Sato S., Kotani H., Tanaka A., Asamizu E., Nakamura Y.,
Miyajima N., Hirosawa M., Sugiura M., Sasamoto S., Kimura T.,
Hosouchi T., Matsuno A., Muraki A., Nakazaki N., Naruo K., Okumura S.
Shimpo S., Takeuchi C., Wada T., Watanabe A., Yamada M., Yasuda M.,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       "Sequence analysis of the genome of the unicellular cyanobacterium Synechocystis sp. strain PCC6803. II. Sequence determination of the entire genome and assignment of potential protein-coding regions."; DNA Res. 3:109-136(1996).
                                  ----KVKIEDLIIYELHVGTF-SQEGNFKGVIEKLD----YLKDLGITGIELMPVAQFPG
                                                                                                                                                                                                                                                       PYF----SDRYKTPWGLTFNFDDRGCDQVRKFILENVEYWFKTFKIDGLRLDAV----
IDDIEENLTYSY-IIEDKREI---PDPASRYQPLGVHDKSQLIRTD---YQILDLG----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Synechocystis sp. (strain PCC 6803).
Bacteria; Cyanobacteria; Chroococcales; Synechocystis.
NCBI_TaxID=1148;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               CFA27B3C86318DB1 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 P73608 PRELIMINARY; PRT; 707 AA. P73608; 01-FEB-1997 (TrEMBLrel. 02, Created) 01-FEB-1997 (TrEMBLrel. 02, Last sequence update) 01-DEC-2001 (TrEMBLrel. 19, Last annotation update) GLYCOGEN OPERON PROTEIN GLGX. GGGX OR SLR1857.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  InterPro: IPR000461; Alpha_amylase.
InterPro: IPR004193; isoamylase_N.
Pfam; PF00128; alpha-amylase; 1.
Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              --KIDEEVLDYYKQLINIRKRY 486
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     KLLFMGNEF-------
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               79895 MW;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          DNA RES. 3:109-136(1996).
EMBL; D90908; BAA17652.1; -.
HSSP; P10342; 1BF2.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            483 DFELHRKMNDYMKELIACYKRY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               707 AA;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Complete proteome
SEOUENCE 707 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                RESULT 14
                                                                                                                                                                                                                       148
                                                                                                                                                                                                                                                                                                                                                                                     258
48
                                                   80
                                                                                                                                                                                                                                                                                                                                  506
                                                                                                                                                                                                                                                                                                                                                                                                                                            256
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         303
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          128
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           467
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             P73608
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             g
à
                                                   පු
                                                                                                          ò
                                                                                                                                                           g
                                                                                                                                                                                                                    δ
                                                                                                                                                                                                                                                                        g
                                                                                                                                                                                                                                                                                                                               ò
                                                                                                                                                                                                                                                                                                                                                                             g
                                                                                                                                                                                                                                                                                                                                                                                                                                         ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     a
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  셤
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ID DATE OF THE SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND SECOND S
```

Length 707;

Score 333.5; DB 16; Pred. No. 4.1e-14;

11.3%; 23.1%;

Query Match Best Local Similarity

```
E.K.,
                                                                                                                                                                                                                                                                                                                                        | :||:|||:|| |:: | | |:: | | |:: | | |:: | | |:: | | |:: | | |:: | | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |:: | |::
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              EKLDYLKDLGITGIELMPVAQF-----PGNRD-----WGYDGVFLYAVQNTYGGPW 169
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      PWGLTFNFDDRG----CDQ--VRKFILENVEYWFKTFKIDGLRLDAVHAIFDNSPKHILQ 268
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              269 EIAEKAHQLGKFVIAESDLNDP----KIVKD--DCG--YKID------AQWVDDFHH 311
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         312 AVHAFITKEKDY------YYQDFGRIEDIEKTF------KDVFVYDGKYS 349
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           117 TVRKFIKGDAGVIGEMAQRLQGSPDLYQGAGRPPSTSINFVTAHDGFTLADLVAYNGKHN 476
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      RYRGRTHGAPVGDLPPRKFVVFIQNHD-QVGNRGNGERLSILTDKTTYLM-AATLYILSP 407
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   408 YIPLIFMGEE-----YYETNPFFFFSDFSDPVLIKGVREGRLKENNOMIDPQSE 456
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     526 GVPMLLMGDEMGKTQDGNNNTYCHDSPFNWLN--------WHLLEQN----QAW 567
-- 47
                                                                           97
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Bacteria; Firmicutes; Bacillus/Clostridium group; Streptococcaceae;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |: ||::||: ||:||: || ||: || ||: || ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||: ||:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        477 YANGENGNDGAND------NYSWNCGVEGPTDNPDILRLRARQMRNAIAILUSQ
                                                                                                                                                                                                                                                             IDDIE-ENLTYSYIIEDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGK------
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  -----ELAKLVNEAHKRGIAVILDVVYNHIGPEGNYLLGLGPYFSDR-----YKT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Tettelin H., Nelson K.E., Paulsen I.T., Eisen J.A., Read T.D., Petterson S., Heidelberg J., DeBoy R.T., Haft D.H., Dodson R.J., Durkin A.S., Gwinn M., Kolonay J.F., Nelson W.C., Peterson J.D., Umayam L.A., White O., Salzberg S.L., Lewis M.R., Radune D., Holtzapple E., Khouri H., Wolf A.M., Utterback T.R., Hansen C.L., McChonald L.A., Feldblyum T.V., Angiuoli S., Dickinson T., Hickey Holt I.E., Loftus B.J., Yang F., Smith H.O., Venter J.C., Dougherty B.A., Morrison D.A., Hollingshead S.K., Fraser C.M.; "Complete genome sequence of a virulent isolate of Streptococcus
FSFGGNIEKNKGIFKLWAPYVNSVKLKLSKKLIPMEKNDEGFFEVE----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ----VKIEDLIIYELHVGTFSQE----
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Created)
Last sequence update)
Last annotation update)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           PRT; 1280 AA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       457 EAFLKSKLSWKIDEEVLDYYKQLINIRKRYNNC 489
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                593
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              568 FRFVKHCIAFRLAHPVL-----RNSEHFQNC
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      01-OCT-2001 (TrEMBLrel. 18, Last sec
01-OCT-2001 (TrEMBLrel. 18, Last sec
01-DEC-2001 (TrEMBLrel. 19, Last an
ALKALINE AMYLOPULLULANASE, PUTATIVE.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       MEDLINE=21357209; PubMed=11463916;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Streptococcus pneumoniae
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           PRELIMINARY;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  SEQUENCE FROM N.A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                NCBI_TaxID=1313;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Streptococcus
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             STRAIN-TIGR4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               297507
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           097507
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               215
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         RESULT 15
~
                                                                                                                                                                                                                                                             48
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          98
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              124
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          307
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       361
```

```
32;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            34 PYFIHDSYDSSDAVNKFDWTKATDGKAYPENVKSRDYMKGLIALRQSTDAFRLKSLQDIK 1043
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          --IRTDYQILDLGKV----KIEDLIIYELHVGTFSQE------GNFKGVIEKLDY 128
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        LKDLGITGIELMPV-------AQFPGNRDWGYDGVFLYAVQNTYGGP-- 168
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             -----WELAKLVNEAHKRGIAVILDVVYNHIGP-----EGNYLLGLGPYFSDRYKTP 215
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            -----WGLTFNFDDRGCDQVRKFILENVEYWFKTFKIDGLRLDAVHAIFDNSPKHIL 267
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           740 RTSFGGGRLGTTHH------MTKRLLIDSIKYLVDTYKVDGFR------FDMMGDHDA 785
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     268 QEIAEKAHQLGKFVIAESDLNDPKIVKDDCGYK------IDAQWV----- 306
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | | : | : : : | | | | | | | | ASI-EEAYKAARAL------NPNLIMLGEGWRTYAGDENMPTKAADQDWMKHTDTVAVF 837
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      307 -DDFHHAVH-------AFITKEKDYYYQDFGRIEDIEKTFKDVFVY------DGKY 348
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             SRYRGRIHGAPVGDL-----PPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAAT 401
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   : | : | : | : | : | : | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | | : | : | | : | : | | : | : | | : | : | | : | : | | : | : | : | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : 
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    402 LYILSPYIPLIFMGEEYYETNPFFFFSDFSDPYLIKGVREGRLKENNQMIDPQSEEAF-- 459
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    -----PFIHSGQEXGRT-----KQFRDPAYKTPVAEDKVPNKSHLLRDKDGNPFDY 983
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          2 FSFGGNI-----EKNKGI-FKLWAPYVNSVKLKLSKK-----LIPMEKNDEGFFEVE 47
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Query Match 11.3%; Score 332.5; DB 16; Length 1280; Best Local Similarity 21.9%; Pred. No. 1.1e-13; Matches 152; Conservative 96; Mismatches 208; Indels 237;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                48 IDDIEE-----NLTYSYIIEDKREIP---DPASRYQPLGVHDKSQL------
                                                                                                                                                                                                                                                                                                                                                                                                                                                A209B802A8E0B328 CRC64;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     : ||: :|| :|| DRVHLITVPGQNGVEK-----EDVVIGYQIT 1069
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  REGNCITLI ---- MEKIGIIASFDDIVINSKIT 525
                                                                                                                                   InterPro; IPR000461; Alpha_amylase.
InterPro; IPR001899; Gram_pos_anchor.
InterPro; IPR001893; isoamylase_N.
Pfam; PF00128; alpha-amylase_N.
Pfam; PF00746; Gram_pos_anchor; 1.
Pfam; PF02922; isoamylase_N; 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                            1280 AA; 142619 MW;
                             Science 293:498-506(2001).
EMBL; AE007340; AAK74446.1; -.
TIGR; SP0268; -.
                                                                                                                                                                                                                                                                                                                                                                                                          Complete proteome.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  86
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           169
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            216
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       349
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     938
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     460
g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 g
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ò
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             οy
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      à
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Ωp
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   δ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           qq
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        g
```

Search completed: July 15, 2002, 12:24:10 Job time: 392 sec

						¥1
•						
	**					
	4					
		4.				
					,	
						•